Biological Services Program

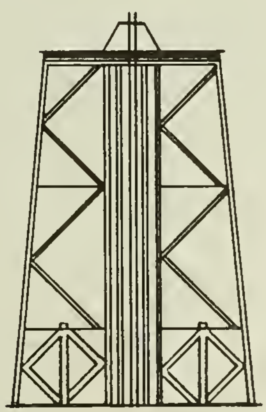
FWS/OBS–77/16.5
March 1978

Environmental Planning for Offshore Oil and Gas

Volume V:

Regional Status Reports

Part 5: Alaska, Washington and Oregon



Fish and Wildlife Service

U.S. Department of the Interior

The Biological Services Program was established within the U.S. Fish and Wildlife Service to supply scientific information and methodologies on key environmental issues that impact fish and wildlife resources and their supporting ecosystems. The mission of the program is as follows:

- To strengthen the Fish and Wildlife Service in its role as a primary source of information on national fish and wildlife resources, particularly in respect to environmental impact assessment.

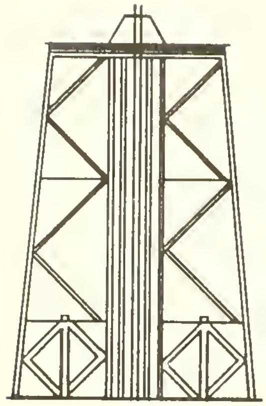
- To gather, analyze, and present information that will aid decisionmakers in the identification and resolution of problems associated with major changes in land and water use.

- To provide better ecological information and evaluation for Department of the Interior development programs, such as those relating to energy development.

Information developed by the Biological Services Program is intended for use in the planning and decisionmaking process to prevent or minimize the impact of development on fish and wildlife. Research activities and technical assistance services are based on an analysis of the issues a determination of the decisionmakers involved and their information needs, and an evaluation of the state of the art to identify information gaps and to determine priorities. This is a strategy that will ensure that the products produced and disseminated are timely and useful.

Projects have been initiated in the following areas: coal extraction and conversion; power plants; geothermal, mineral and oil shale development; water resource analysis, including stream alterations and western water allocation; coastal ecosystems and Outer Continental Shelf development; and systems inventory, including National Wetland Inventory, habitat classification and analysis, and information transfer.

The Biological Services Program consists of the Office of Biological Services in Washington, D.C., which is responsible for overall planning and management; National Teams, which provide the Program's central scientific and technical expertise and arrange for contracting biological services studies with states, universities, consulting firms, and others; Regional Staff, who provide a link to problems at the operating level; and staff at certain Fish and Wildlife Service research facilities, who conduct inhouse research studies.



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Volume V: Regional Status Reports

Part 5: Alaska, Washington and Oregon

by

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ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS

FOREWORD

This report is one in a series prepared by The Conservation Foundation for the Office of Biological Services of the U.S. Fish and Wildlife Service (Contract 14-16-0008-962). The series conveys technical information and develops an impact assessment system relating to the recovery of oil and gas resources beyond the three-mile territorial limit of the Outer Continental Shelf (OCS). The series is designed to aid Fish and Wildlife Service personnel in the conduct of environmental reviews and decisions concerning OCS oil and gas development. In addition, the reports are intended to be as helpful as possible to the public, the oil and gas industry, and to all government agencies involved with resource management and environmental protection.

Oil and gas have been recovered for several decades from the Outer Continental Shelf of Texas, Louisiana and California. In the future, the Department of the Interior plans to lease more tracts, not only off these coasts, but also off the frontier regions of the North, Mid- and South Atlantic, eastern Gulf of Mexico, Pacific Northwest and Alaska. Within the set of constraints imposed by the international petroleum market (including supply, demand and price), critical decisions are made jointly by industry and government on whether it is advisable or not to move ahead with leasing and development of each of the offshore frontier areas. Once the decision to develop a field is made, many other decisions are necessary, such as where to locate offshore platforms, where to locate the onshore support areas, and how to transport hydrocarbons to market.

Existing facilities and the size of the resource will dictate which facilities will be needed, what the siting requirements will be, and where facilities will be sited. If the potential for marketable resources is moderate, offshore activities may be staged from areas already having harbor facilities and support industries; therefore, they may have little impact on the coast adjacent to a frontier area. An understanding of these options from industry's perspective will enable Fish and Wildlife Service personnel to anticipate development activities in various OCS areas and to communicate successfully with industry to assure that fish and wildlife resources will be protected.

The major purpose of this report is to describe the technological characteristics and planning strategy of oil and gas development on the Outer Continental Shelf, and to assess the effects of OCS oil and gas operations on living resources and their habitats. This approach should help bridge the gap between a simple reactive mode and effective advanced planning--planning that will result in a better understanding of the wide range of OCS activities that directly and indirectly generate impacts on the environment, and the countermeasures necessary to protect and enhance living resources.

Development of offshore oil and gas resources is a complex industrial process that requires extensive advance planning and coordination of all phases from exploration to processing and shipment. Each of hundreds of system components linking development and production activities has the potential for adverse environmental effects on coastal water resources. Among the advance judgements that OCS planning requires are the probable environmental impacts of various courses of action.

The relevant review functions that the Fish and Wildlife Service is concerned with are: (1) planning for baseline studies and the leasing of oil and gas tracts offshore and (2) reviewing of permit applications and evaluation of environmental impact statements (EIS) that relate to facility development, whether offshore (OCS), near shore (within territorial limits), or onshore (above the mean high tidemark). Because the Service is involved with such a broad array of activities, there is a great deal of private and public interest in its review functions. Therefore, it is most valuable in advance to have some of the principles, criteria and standards that provide the basis for review and decisionmaking. The public, the offshore petroleum industry, and the appropriate Federal, state, and local government agencies are thus able to help solve problems associated with protection of public fish and wildlife resources. With advanced standards, all interests should be able to gauge the environmental impacts of each OCS activity.

A number of working assumptions were used to guide various aspects of the analysis and the preparation of the report series. The assumptions relating to supply, recovery, and impacts of offshore oil and gas were:

1. The Federal Government's initiative in accelerated leasing of OCS tracts will continue, though the pace may change.

2. OCS oil and gas extractions will continue under private enterprise with Federal support and with Federal regulation.

3. No major technological breakthroughs will occur in the near future which could be expected to significantly change the environmental impact potential of OCS development.

4. In established onshore refinery and transportation areas, the significant impacts on fish and wildlife and their habitats will come from the release of hydrocarbons during tanker transfers.

5. A significant potential for both direct and indirect impacts of OCS development on fish and wildlife in frontier areas is expected from site alterations resulting from development of onshore facilities.

6. The potential for onshore impacts on fish and wildlife generally will increase, at least initially, somewhat in proportion to the level of onshore OCS development activity.

The assumptions related to assessment of impacts were:

1. There is sufficient knowledge of the effects of OCS development activities to anticipate direct and indirect impacts on fish and wildlife from known oil and gas recovery systems.

2. This knowledge can be used to formulate advance criteria for conservation of fish and wildlife in relation to specific OCS development activities.

3. Criteria for the protection of environments affected by OCS-related facilities may be broadly applied to equivalent non-OCS-related facilities in the coastal zone.

The products of this project--reported in the series Environmental Planning for Offshore Oil and Gas--consist of five technical report volumes. The five volumes of the technical report series are briefly described below:

Volume I — Reviews the status of oil and gas resources of the Outer Continental Shelf and programs for their development; describes the recovery process step-by-step in relation to existing environmental regulations and conservation requirements; and provides a detailed analysis for each of fifteen OCS activity and facility development projects ranging from exploration to petroleum processing.

Volume II — Discusses growth of coastal communities and effects on living resources induced by OCS and related onshore oil and gas development; reports methods for forecasting characteristics of community development; describes employment characteristics for specific activities and onshore facilities; and reviews environmental impacts of probable types of development.

Volume III — Describes the potential effects of OCS development on living resources and habitats; presents an integrated system for assessment of a broad range of impacts related to location, design, construction, and operation of OCS-related facilities; provides a comprehensive review of sources of ecological disturbance for OCS related primary and secondary development.

Volume IV — Analyzes the regulatory framework related to OCS impacts; enumerates the various laws governing development offshore; and describes the regulatory framework controlling inshore and onshore buildup in support of OCS development.

Volume V — In five parts, reports current and anticipated OCS development in each of five coastal regions of the United States: New England; Mid and South Atlantic: Gulf Coast; California; and Alaska, Washington and Oregon.

John Clark was The Conservation Foundation's project director for the OCS project. He was assisted by Dr. Jeffrey Zinn, Charles Terrell and John Banta. We are grateful to the U.S. Fish and Wildlife Service for its financial support, guidance and assistance in every stage of the project.

William K. Reilly
President
The Conservation Foundation

PREFACE

This report is one of five regional reviews, the fifth volume in a series of background reports on the impacts of Outer Continental Shelf (OCS) oil and gas recovery sponsored by the U.S. Fish and Wildlife Service, Office of Biological Services, and prepared by The Conservation Foundation (under Contract 14-16-0008-962). The five reviews are: New England, Mid and South Atlantic, Gulf Coast, California, and Alaska, Washington and Oregon. Other volumes in the series and the overall purposes of the OCS project are described in the Foreword.

The regional reports focus on past and potential impacts on living resources and on their habitats in each region. They also highlight prominent coastal resource-related issues associated with proposed OCS lease sales.

The regional reports present brief overviews of the status of offshore oil and gas activities and impacts for the selected regions. They are meant to inform U.S. Fish and Wildlife Service employees and other interested persons outside the subject region who wish to be generally knowledgeable about the status of OCS around the country and both past and anticipated effects on living resources of the region.

The reports were prepared by analysts who are recognized for their expertise in OCS impacts or coastal zone management. The contents and organization of the reports are as consistent as possible given regional differences in subject matter and differences in the authors' approaches. Each study has five sections:

1. The initial section of each regional report is a discussion of past and present OCS production. This provides a historical perspective that establishes a setting for the remaining sections. Statistics on lease sales, production and reserves are important topics in this section.

2. The second section describes OCS development and future potential, including industry activities, the present leasing schedule and anticipated future projects. This section varies depending upon the amount of anticipatory investigation completed by public agencies and industry.

3. The third section discusses the effects on living resources of activities that accompany OCS petroleum development. A majority of these concerns occur near shore or onshore, where resource values and high impact potential are concentrated. The relative importance of particular habitats

and living resources vary by region. For example, shellfish may be of paramount concern in one region, birds in a second region, and coastal marshes and wetlands in a third region.

4. The fourth section concerns socio economic impacts. These issues are generally treated in less detail, because living resources is the primary subject of the project and the socio economic impact information is only to provide a working background. Since socio economic impacts have been the subject of many other studies, and interest in most areas has centered on socio economic rather than living resource impacts, there is extensive information elsewhere on this subject. Two major topic areas are included in each report: effects of anticipated development and regional interest in OCS.

5. The fifth section is regional information analysis. Publications of regional import are annotated. Each study lists about a dozen publications which contain the best regional research into OCS and related issues.

Each regional report is meant to provide a compilation of information available for the region through midyear 1976.

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

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Additional assistance was provided by U.S. Fish and Wildlife Service personnel familiar with the area covered by this report: Leroy Soule (Washington, D.C.) Office of Biological Services, and Jay Watson and John Byrne (Portland, Oregon) Office of Biological Services.

Dr. J. Clarence Davies, Executive Vice President, The Conservation Foundation, provided institutional review and editorial guidance. Portions of the draft reports were reviewed by staff members Raymond Tretheway and Claudia Wilson.

5.1 -- INTRODUCTION

This report presents the latest information available (October of 1976) regarding OCS development adjacent to the States of Alaska, Washington, and Oregon. In response to requests by the users of this report, the Conservation Foundation and the U.S. Fish and Wildlife Service, the report focuses on the following:

1. Environmental and socio economic impacts,
2. Current status of OCS operations in the region,
3. History of OCS operations in the region, and
4. Proposed onshore support site and activities.

Although this report is intended as a summary document, it does present some specific information describing fish and wildlife species and habitats likely to be adversely affected by OCS development.

Outer Continental Shelf (OCS) petroleum development is an issue of immense importance in Alaska. Approximately 60 percent of both U.S. Outer Continental Shelf lands and potential offshore petroleum resources lie adjacent to the state. Industry interest in developing the many potential petroleum basins coupled with national concern over U.S. energy dependence on foreign petroleum has resulted in strong pressures to rapidly develop the Alaskan OCS. However, OCS development in Alaska will encounter hostile ice, weather, and seismic conditions as well as opposition from many state residents and government officials concerned about negative environmental economic and social impacts.

Past petroleum development in Alaska has been limited to onshore lands (e.g., Prudhoe Bay) and state-owned offshore lands (e.g., Cook Inlet). Prior to April 13, 1976, no leasing had ever taken place on Alaska's Outer Continental Shelf. On that date, however, the first of many proposed lease sales took place, the northern Gulf of Alaska sale. Exploratory drilling and support activities in the Gulf of Alaska have only begun as a result of this sale. Despite the great potential of the Alaskan OCS, no petroleum resources have ever been recovered nor will they be for several years until exploration and development activities produce results.

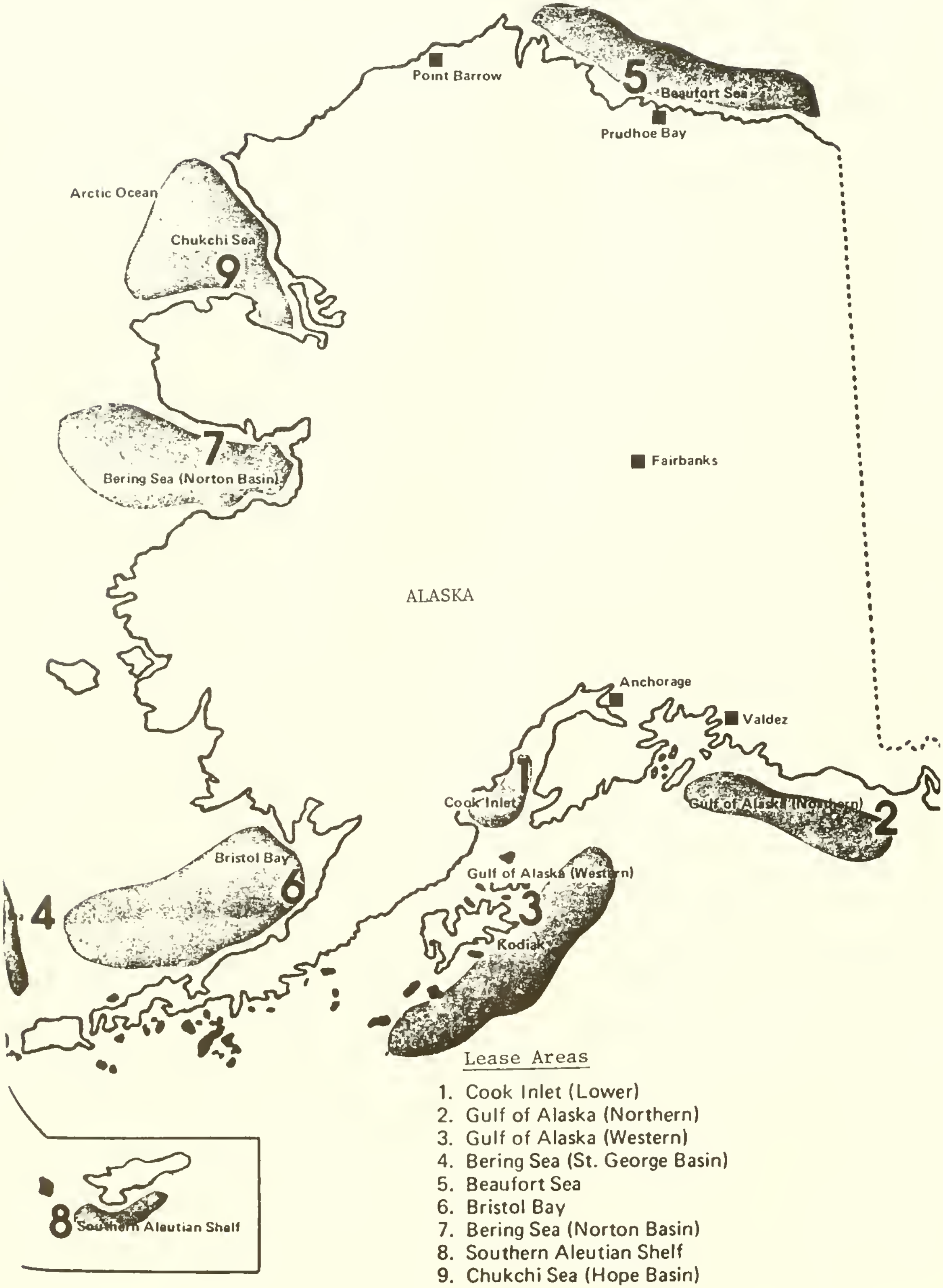
Substantial uncertainty exists concerning the amount of petroleum present on Alaska's Outer Continental Shelf. Because the Alaskan OCS is a frontier region lacking previous drilling experience and incomplete seismic information, it is difficult to estimate potential petroleum resources. All petroleum thought to exist on the Alaskan OCS is classified

by the USGS and oil companies as undiscovered, recoverable oil and natural gas resources. Undiscovered, recoverable resources are those quantities of oil and gas which are reasonably expected to exist in favorable geologic settings but which have not yet been identified by drilling. When the existence of recoverable hydrocarbons are confirmed by exploration, the resources are reclassified as "reserves." Since June 1975, the U.S. Geological Survey has calculated Alaska OCS petroleum resources by a series of probability estimates. The undiscovered recoverable oil resources for offshore Alaska range from 3 to 31 billion barrels with a mean of 15 billion barrels (there is a 95 percent chance that at least 3 billion barrels will be recovered and a 5 percent chance that at least 31 billion barrels will be recovered). The range for undiscovered recoverable natural gas resources is from 8 to 80 trillion cubic feet with a mean of 44 trillion cubic feet.[1]

Nine distinct petroleum basins are located on the vast Continental Shelf surrounding the state (Figure 1). Numerous lease sales are proposed for these basins, the number and timing of which will depend upon future seismic information, hydrocarbon finds and socic political considerations. Presently the Department of Interior has scheduled six areas for at least one sale.[2] Interior's proposed lease schedule issued in November 1976) for these Alaskan OCS areas are as follows:

1. Northern Gulf of Alaska - April 1976
2. Lower Cook Inlet - February 1977
3. Western Gulf of Alaska (Kodiak) - November 1977
4. Beaufort Sea - February 1978
5. Beaufort Sea - February 1979

Figure 1. Potential offshore leasing areas in Alaska (Source: Alaska Industry, October 1975).



6. Northern Gulf of Alaska - May 1979

7. Chukchi Sea - December 1979

8. Bering Sea (St. Georges Basin) - May 1980

9. Lower Cook Inlet - August 1980

10. Western Gulf of Alaska (Kodiak) - December 1980

Three other petroleum basins, Bering Sea (Norton Basin), Southern Aleutian Shelf, and Bristol Bay had been scheduled for leasing by Interior in July 1975, however, due to opposition from the State of Alaska, lease sales in these areas have been indefinitely postponed.

Table 1 presents information about past actions and future plans for developing the Alaskan OCS. Dates predicting future development activities are only estimates and will be influenced by a host of factors including date of lease sale, availability of capital, materials and manpower, worldwide and domestic petroleum markets, and Alaska state policies and facility siting regulations. Further, most experts agree that industry is not yet technologically prepared to develop any offshore areas north of St. George basin except in shallow, protected waters where artificial earthen islands can be created for working platforms.

As previously mentioned, the State of Alaska has leased several offshore areas including tracts in the Gulf of Alaska and Cook Inlet.[4] The great majority of state offshore activity has and is occurring in Cook Inlet where since 1959 a total of 1.9 million acres, have been leased for bonus bids of over $89 million. Cook Inlet Basin (including onshore lands) has yielded the majority of oil and gas production from state lands, with 600 million barrels of oil and 1.6 trillion cubic feet of gas having been produced through 1975.[5] Currently there are 14 offshore platforms operating in Cook Inlet.[6]

Table 1. Alaskan OCS Oil and Gas Activities and Plans

Lease Area	Activities								
	Baseline Studies	Geophysical Exploration	Call for Nomination	Selection of Tracts	BLM EIS	Lease Sale(s)	Initial Exploratory Drilling	Initial Development Wells	Peak Production
Northern Gulf	Moderate	Extensive	November 1974	March 1975	Draft: July 1975 Final: Jan. 1976	April 1976 and May 1979	*Fall* 1976-1977	1979	1980
Lower Cook Inlet	Moderate	Little - Moderate	September 1975	March 1976	Draft: July 1976 *Final: Nov.* 1976	*Feb.* 1976 *and August* 1980	1978 1979	1979	1984 1985
Western Gulf (Kodiak Shelf)	Little	Little	January 1976	May 1976	1976 1977	*Nov.* 1977 *and Dec.* 1980	1978 1979	1980 1981	1990's
Beaufort Sea	Little	Moderate	*October* 1976	*December* 1976	1977 1978	*Feb.* 1978 *and Feb.* 1979	1978 1979	1979	1990's
Chukchi Sea	Little	Very Sparse	1978	1978	1979	*December* 1979	1980 1982	*Mid-* 1980 s	1990's
Bering Sea (St. George Basin)	Little	Little	December 1974	March 1976	1979 1980	*May* 1980	1982	1980 s	1990's
Bering Sea (Norton Basin)	Little	Very Sparse	Uncertain	Uncertain	Uncertain	Indefinately Postponed	Uncertain	Uncertain	Uncertain
Southern Aleutian Shelf	Little	Very Sparse	Uncertain	Uncertain	Uncertain	Indefinately Postponed	Uncertain	Uncertain	Uncertain
Bristol Bay	Little	Little	Uncertain	Uncertain	Uncertain	Indefinately Postponed	Uncertain	Uncertain	Uncertain

5.2.1 OCS Impacts in Alaska

Strong opposition to the Department of Interior's accelerated leasing program has mounted in Alaska because many fear that negative environmental and socio economic impacts will outweigh the beneficial effects of OCS development.[7] Many Alaskans are irritated by what they regard as the insensitivity of Federal officials responsible for the OCS leasing program to the problems of coastal and onshore impacts.

There are some good reasons for believing that substantial impacts may result from OCS operations in Alaska. First, extensive petroleum operations will occur in pristine but hostile environments. Second, adjacent to future OCS drilling are some of the world's most productive and valuable fisheries and an abundance of birds and wildlife.[8] Third, onshore support operations will locate along sparsely settled coastal regions where even moderate increases in population will tend to overwhelm present community services and lifestyles. Finally, over half of all domestic offshore petroleum operations will occur in a state that is woefully lacking in planning expertise and management authority.

However, for several reasons it is very difficult to predict precisely the magnitude and location of OCS impacts. First, no one is sure how much petroleum exists on the Alaskan OCS and where it is. The existence of petroleum cannot be known with assurance until exploratory drilling has taken place. As noted earlier, USGS high and low resource estimates in Alaska vary greatly. Since onshore and offshore development activities are directly proportional to the amount of petroleum found, it is uncertain how severe OCS impacts may be. In addition, there are other factors important in determining impacts. These include the rate at which

petroleum is exploited, the occurrence of other events (e.g., onshore petroleum finds, natural gas pipeline) and the occurrence of statistically improbable events (e.g., a massive oil spill during the height of a bird migration season). Impact prediction is further hindered by limited information about environmental conditions and processes and by primitive impact assessment methodologies.

Despite the difficulty of predicting OCS impacts in Alaska, some general impacts will probably occur.[9] These are listed and discussed briefly as follows:

1. Environmental resources may become contaminated and/or destroyed by massive and chronic oil spills. Such spills may occur from well blowouts, transportation and handling mishaps, or pipeline leaks and breaks.
2. Fisheries and wildlife habitat may be destroyed during the construction and operation of onshore and nearshore support facilities. Dredging, filling and effluent discharges all pose a threat to these resources.
3. Secondary impacts on environmental resources may result from housing and infrastructure development to accommodate increases in population. These impacts may be more severe than the primary impacts from energy facilities.
4. Local economics and lifestyles may be disrupted by the boom and bust cycle of oil development and production. Population increases may strain the financial and planning resources of small towns and villages and the eventual decline in petroleum operations may leave a depressed economy and high unemployment.

5. Political and social conflicts may result from contact between the highly paid newcomers and established residents mainly involved in fishing, hunting, and forestry. Disputes may arise over the use of port facilities, damage to biological resources and to fishing gear, and an increase in congestion and crime.

6. Alaskan natives are worried about cultural impacts resulting from OCS development.[10] In many coastal communities small native populations may lose their political majorities and power to incoming residents. Subsistence hunting and tribal ways may be altered by pollution and by population increases resulting from OCS operations.

7. OCS operations may provide economic income and jobs to natives and non-natives. Rental fees, increased sales and commerce, and employee income are all sources of wealth for coastal towns and villages.

Some researchers and government officials believe that Alaskan OCS impacts may be comparable to Scotland's experience with North Sea petroleum. In particular, Scotland's tiny Shetland Islands provide some interesting parallels with Alaska in that they both are located in regions of severe weather, are sparsely settled, and are facing massive and rapid offshore petroleum development.[11] However, the institutional differences between the two countries cannot be ignored nor can it be assumed that Alaska will undertake the same kind of sound planning that the Shetlanders have been practicing.[12]

Alaska has a wide range of environmental conditions, hazards, economic activity and infrastructure development. Considering the size and diversity of Alaska's environment, OCS impacts will vary considerably depending upon where development occurs. Consequently this report examines each of the nine proposed leasing areas separately. Each leasing area is examined with respect to (1) a brief description of the area, (2) its petroleum resources, (3) the status of OCS operations, and (4) environmental and socio economic impacts.

5.2.2 Northern Gulf of Alaska

Description of the Region[13]

The topography of the northern Gulf of Alaska is extremely irregular; many mountains in the coastal ranges exceed 10,000 ft. and some of the highest peaks (e.g., Mt. St. Elias - 18,000+ ft) are only 20 miles from the ocean. Only a few inlets intervene from the eastern extension of the Gulf to Prince William Sound, the most important being Yakutat Bay. The Continental Shelf of the Gulf is narrow, ranging in width from 8 to 65 miles

Earthquakes are common in the area. The epicenter of the devastating Alaskan earthquake in 1964 (8.5) was located about 50 miles west of Valdez. During the past 75 years, there have been nine earthquakes which had a magnitude of eight or greater and over 60 with a magnitude of seven or greater.[14]

The Gulf of Alaska is well known for its frequent and violent storms. Sea heights as great as 70 ft have been recorded during storms[15] and 15 to 20 ft. seas are common, particularly during the winter months.

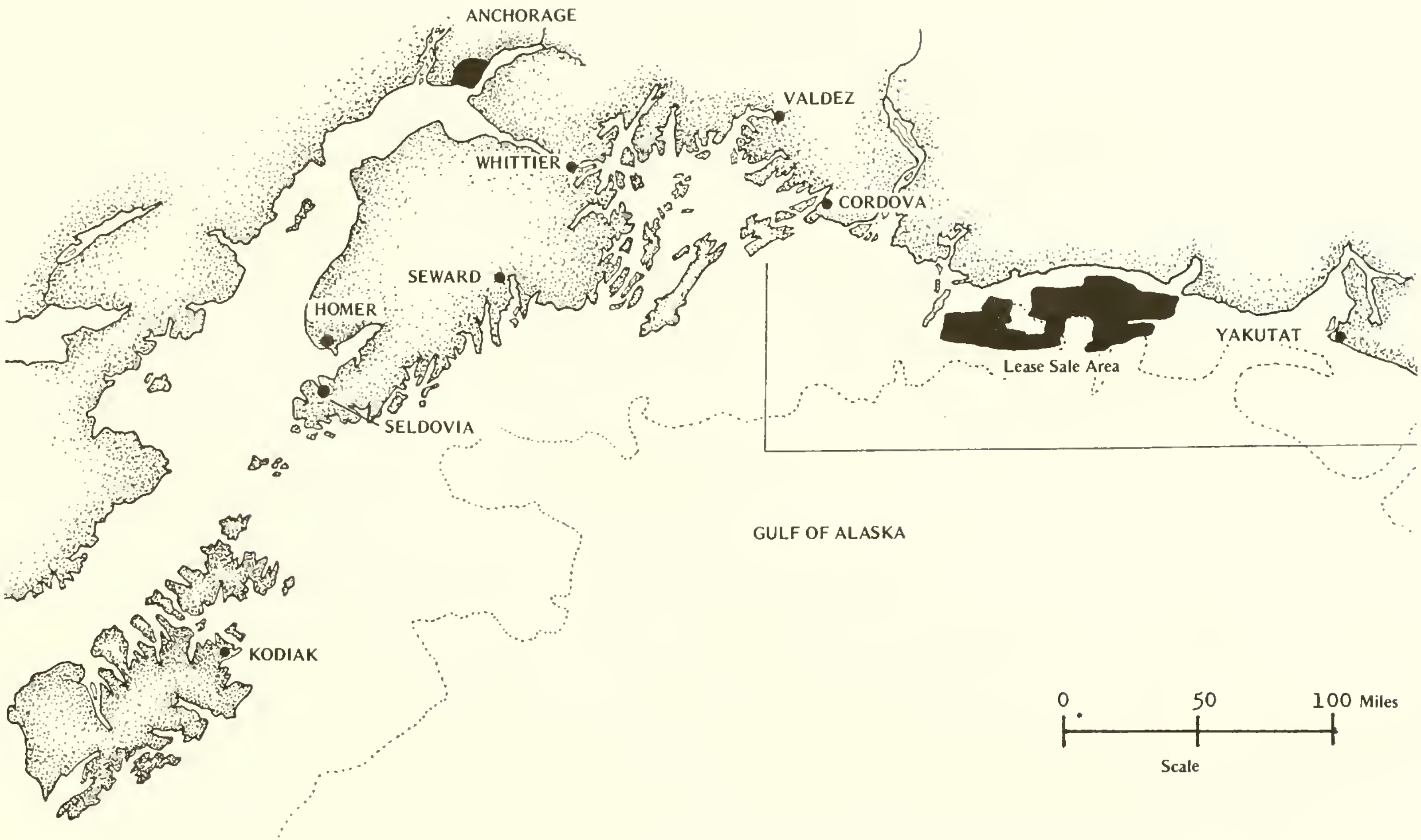
The warm north-flowing Alaska Current moderates surface temperatures and keeps the coast free of ice in the winter except in protected waters. This counterclockwise current dominates circulation patterns in the Gulf.

Nearshore areas are important spawning and feeding grounds for many immature fishes and crustaceans. All five species of Pacific salmon are harvested by U.S. fishermen in the Gulf of Alaska, along with Pacific halibut, sablefish, and Pacific herring; king, tanner, and dungeness crabs; and several species of shrimp. Foreign trawl fisheries are also active in the region, primarily seeking Pacific ocean perch, sablefish, Pacific cod, walleye pollock and several species of flatfish.

The coastal zone is an important habitat for numerous birds and marine mammals. More than 100 nesting colonies of alcids, kittiwakes and other gulls, several numbering in the hundreds of thousands, occur on the rocky cliffs along the Gulf. Intertidal mud flats are stopover points for migrant shorebirds that number in the millions. Similarly, numerous marine mammals live in the region, including harbor seals, sea lions, several species of baleen and toothed whales and several porpoise species, all of which congregate in the nearshore waters along the rocky coasts.

Most of the human population is located in the predominantly non-native coastal communities of Cordova, Seward, Whittier and Valdez (Fig. 2). These communities depend on marine and air transportation. Only Valdez and Seward are directly linked to the state's highway system, although Whittier is connected by rail. Commercial fishing and government employment are the main sources of income. A number of smaller communities

Figure 2. Only a few small coastal communities are adjacent to the Gulf of Alaska.



also exist and these are mostly populated by Alaska natives - Aleuts, Eskimos, and Indians (Eyak, Tatitlek, Yakultaga, and Yakutat). These native communities depend on marine and coastal fish and wildlife for employment and subsistence.

Petroleum Resources

Industry has long regarded the northern Gulf as a prime prospect for OCS development. In response to a Department of Interior survey, the petroleum industry selected the Gulf of Alaska as the frontier area possessing the greatest oil and gas potential.[16] Geologists have been very excited over a 100-mile region from Kayak Island to Icy Bay (see Fig. 3) where enormous petroleum structures as large as 20 miles long and 10 to 15 miles wide have been reported.[17]

However, no one really knows the extent of oil and gas resources that lie under the waters of the northern Gulf. USGS estimates of recoverable petroleum resources span a large range, from 100 million to 2.8 billion barrels of oil and 300 billion to 9 trillion cubic feet of natural gas at the 95 percent and 5 percent probability levels, respectively.[18]

Status of OCS Operations

Petroleum industry interest in the northern Gulf of Alaska dates back to the late 1960's. In 1968, 26 oil companies nominated 4.6 million acres for leasing in the Gulf in response to a Department of Interior call for nominations. A lease sale was scheduled in the summer of 1969, but was cancelled primarily due to events surrounding the Santa Barbara oil spill.[19]

Northern Gulf leasing activity began again in 1974 as a result of the federal accelerated OCS leasing program. The Department of Interior scheduled an early lease sale in the northern Gulf because of keen oil industry interest in the area. Another call for nominations was issued by Interior in November 1974 for about 11.8 million acres and petroleum companies responded by nominating approximately 7.2 million acres.[20]

But federal government plans to lease the northern Gulf of Alaska brought storms of protest from environmentalists and the State of Alaska. The state urged postponement of the northern Gulf sale until baseline information was gathered and interpreted, OCS policies were changed to give the State a greater role, provisions were made for sharing OCS revenues, and efforts were taken to reduce the risk of adverse impacts. Governor Hammond made clear the State's intention to go to court to enjoin the Federal leasing program if the northern Gulf sale was not delayed and a Federal commitment given to cure the serious defects of the Alaskan and national OCS programs.[21] Alaska's position was bolstered when the CEQ, EPA and NOAA joined the state in calling for the indefinite postponement of the northern Gulf sale because of the high risk of environmental damage.[22]

Secretary Kleppe, nevertheless, after ordering a reduction in leasing acreage from 1.8 million to 1.1 million, decided to hold the lease sale without further delay.[23] Against the background of strenuous state opposition and an unsuccessful state court suit, the Bureau of Land Management leased the northern Gulf on April 13, 1976.[24] A second lease sale is scheduled for May 1979.

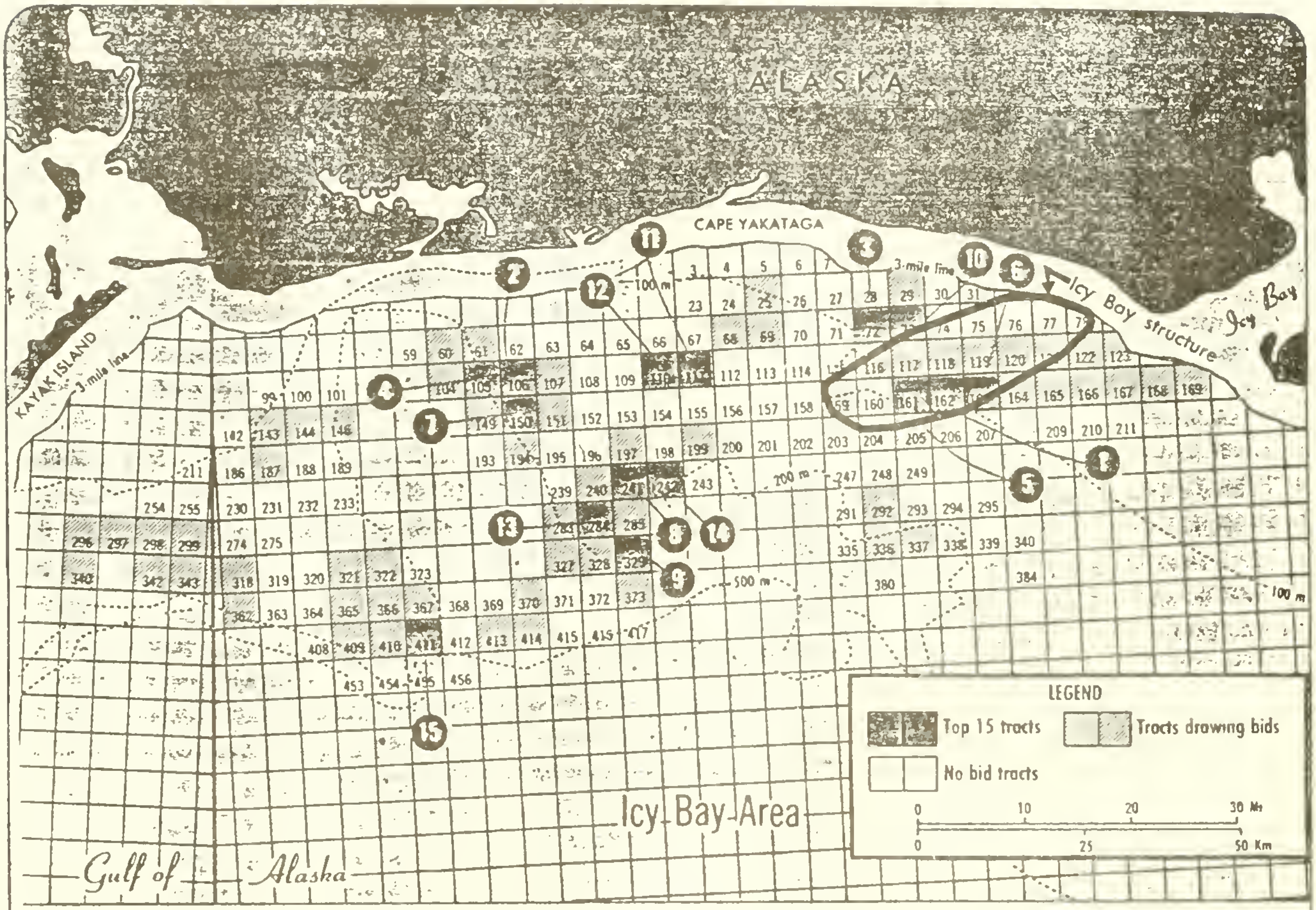
The petroleum industry led by Shell and Arco offered over $571 million in high bids for leases on 81 of 189 tracts offered in the northern Gulf (Fig. 3).[25] Oil comapny bids failed to reach Interior's $1 billion pre-sale estimate. Industry claimed the projected high costs for drilling and development in the northern Gulf were responsible for the low bids.[26]

The successful lessees have indicated that they plan to begin exploratory drilling soon in the northern Gulf. Three companies, Shell, Arco and Mobil (SAM) hope to begin drilling by the end of 1976. Shell Oil, operator for the combine, will drill the first well in Block 106 (Tract 42) on a structure in the western Icy Bay area.[27] Two semi-submersible rigs are being built by Kaiser Shipyard near San Francisco specifically for use in the Gulf of Alaska. Other rigs are available in Japan, the North Sea and Southeast Asia.[28]

The rigs under construction at Kaiser are of the Sedco 700 Series.[29] A Sedco 706 was completed for use by SAM in the fall of 1976 and a 708 will be completed in early 1977. These rigs have been designed for year-round work in the Gulf of Alaska and will have a drilling capability of 25,000 ft with an ability to operate in waters up to 1,000 feet. Operating these rigs will be expensive; current estimates place the cost at $100,000 per day.[30]

The Sedco 706 rig will be serviced out of Yakutat, 145 miles east of the drilling operations (Fig. 2). Support facilities for exploratory drilling are currently being built at Yakutat by the SAM consortium.[31]

Figure 3. The top 15 lease tracts and all tracts drawing bids are indicated for the April 1976 sale (Source: Oil and Gas Journal, April 19, 1976).



Key No.	Block No.	Amount bid	Per acre	Bidders
1	162	$62,756,352	$11,033	Texaco 64%, Allied Chem. 12%, Champlin 12%, Diamond Shamrock 12%
2	106	61,880,000	10,869	Shell 59%, ARCO 25%, Oil Dev. Co. of Texas 6%, Tex. Eastern 10%
3	72	41,104,000	7,220	ARCO 50%, Shell 50%
4	105	40,799,232	7,116	Gulf
5	161	35,345,550	6,208	Amoco 37.5%, Oxy 37.5%, Idemitsu 25%
6	163	33,683,000	5,916	ARCO 45%, Shell 45%, Oil Dev. Co. of Texas (ODCT) 10%
7	150	32,326,000	5,678	Shel 55%, ARCO 25%, Tex. Eastern 10%, ODCT 10%
8	241	28,196,352	4,953	Texaco 50%, Allied Chem 12%, Champlin 12%, Diamond Shamrock 12%, Aquitaine 8%, Odeco 6%
9	329	25,132,032	4,414	Gulf 35%, Amerada Hess 17.5%, Getty 17.5%, Texasgulf Inc. 10%, PanCanadian Pet. 10%, Superior 5%, Canadian Superior 5%
10	73	20,630,000	3,623	ARCO 50%, Shell 50%
11	111	17,011,500	2,988	ARCO 50%, Shell 50%
12	110	15,337,500	2,696	ARCO 50%, Shell 50%
13	284	11,210,000	1,969	Exxon
14	242	10,847,200	1,905	Mobil 15%, Skelly 20%, Cities Service 20%, Sun 20%, Amer. Petrofina 15%, Hamilton Bros. 10%
15	411	10,074,100	1,769	Mobil 37%, Skelly 15%, Cities Service 15%, Sun 18%, Amer. Petrofina 15%

*All in Icy Bay area

OGJ

Environmental and Socioeconomic Impacts[32]

As previously mentioned the severity of petroleum development impacts depend in large part upon the volume and rate at which oil and gas resources are exploited. OCS impact studies, therefore, must make some estimates regarding future levels of petroleum production. In the northern Gulf, previous studies have assumed high production scenarios. These production assumptions are as follows:

(1) The Bureau of Land Management in its final environmental impact statement assumed the sale area would produce 2.8 billion barrels of oil and 9 trillion cubic feet of gas. The peak production volume was estimated at 550,000 barrels/day for oil and at 1 billion cubic feet/day for gas.[33]

(2) Mathematical Science Northwest's study assumed that a total of five fields would be discovered in the Gulf of Alaska (not limited to the northern Gulf Sale area) with a peak production of oil at 550,000 barrels/day.[34]

(3) The CEQ report assumed that peak production in the Gulf of Alaska (not limited to the northern Gulf Sale area) would reach a level of 2 million barrels/day and 7.2 billion cubic feet/day by 1998.[35]

Additional estimates of the rate and type of development are also made by BLM and these are shown in Tables 2 and 3. These tables show that:

(1) At peak production, 22 platforms would be required, 18 oil platforms and 4 gas platforms.

(2) There would be from 70 to 100 exploratory wells and approximately 800 production wells.

Table 2. Schedule and Summary of Investments and Production (all costs are totals and expressed in millions of dollars) (Source: BLM Northern Gulf Final EIS[13])

Year	Exploratory Wells Number	Exploratory Wells cost	Platforms and Equipment Number	Platforms and Equipment cost	Development Wells Number	Development Wells cost	Onshore Facilities Number	Onshore Facilities cost	Large Pipelines Miles	Large Pipelines cost	Terminals: Onshore No.	Terminals: Onshore cost	Terminals: Offshore No.	Terminals: Offshore cost	Total Investment Costs	Production: Oil Mil bbls	Production: Gas Bil cf
1975																	
1976	6	42													42		
1977	15	105													105		
1978	26	182					1	25							207		
1979	26	182					1	25							207		
1980	15	105	2	120			1	25	50	50					300		
1981	8	56	4	240	40	80			75	75	1	50			501	15	
1982	4	28	6	360	120	240			75	75	1	50	1	75	828	45	
1983			6	360	200	880			50	50	1	550	1	75	1915	80	100
1984			2	120	220	440			50	50					610	120	260
1985			2	120	180	360									480	185	330
1986					40	80									80	200	330
1987																200	330
1988																195	330
1989																185	330
1990																175	330
1991																165	330
1992																155	330
1993																145	330
1994																135	330
1995																125	330
1996																115	330
1997																105	330
1998																95	330
1999																85	330

Continued next page

Table 2 (continued)

Year	Exploratory Wells Number/cost	Platforms and Equipment Number/cost	Development Wells Number/cost	Onshore Facilities Number/cost	Large Pipelines Miles/cost	Terminals		Total Investment Costs	Production	
						Onshore No./cost	Offshore No./cost		Oil Mil bbls	Gas Bil cf
2000									75	330
2001									65	330
2002									50	330
2003									40	280
2004									30	260
2005									20	190
2006										130
2007										40
TOTALS	700	1,240	2,080	75	300	650	150	5,170		

[a] Includes gas liquifaction (LNG) plant

Table 3. Summary of Basic Assumptions on Oil and Gas Production in the Gulf of Alaska (Source: BLM Northern Gulf Final EIS[13])

Activity	This Proposed Sale
Sale acreage offering	1.8 million acres
Anticipated sale	1.4 million acres
Oil and gas fields	7
Average distance of oil fields from shore	22 miles 1/
Recoverable oil (5% probabilities)	2.8 billion bbls (b.bbls) 2/
Recoverable gas (5% probabilities)	9 trillion cubic feet (t. cu. f.) 2/
Peak production oil	550,000 bbls/da 200 million bbls (m.bbl)/yr 2/
Peak production gas	1.0 billion cu.ft/da 365 billion cu.ft/yr 2/
Platforms	22 2/
Wells	900 2/ (100 exploratory, 800 development)
Pipelines	7 to 14
Total miles of pipeline	300 (50 onshore; 250 offshore)
Pipeline burial excavation volume	.9 to 2.4 million cu.ft. 2/
Offshore terminal facilities	2
Onshore pipeline acreage required	315 acres
Onshore terminal facilities	3 (360 acres)
Support/supply facilities	3 (240 acres)
LNG plant	1 (120 acres); 0 if combined with terminal 2/
Onshore land requirements	1,035 acres
Offshore land requirements	800 to 7700 acres (4 to 350 acres per platform)*
Petroleum refineries/ platform fabrication	0
Servicing fleet (boats & ships)	20 to 60 2/
Annual crude shipped by tanker	200 million bbls/yr

* Based on four acres for a jack-up rig and 350 acres for each semi-submersible rig and offshore terminal, and their attendant guy lines.

1/ - USDI 1974d
2/ - USDI 1975b

(3) There would be 7 to 14 major pipelines totaling 300 miles in length, of which 50 miles would be constructed onshore and 250 miles would be submarine.

(4) No petroleum refineries are expected to be constructed in Alaska as a result of the sale.

(5) Drilling platforms would be built outside of Alaska.

(6) Natural gas would be marketed, and there would be one liquified natural gas (LNG) plant constructed around 1983.

(7) The fleet required to support and service the offshore platforms would range between 20 to 60 work boats.

(8) Total onshore land requirements would be 1,035 acres.[36]

A number of onshore locations have been identified as potential support sites for northern Gulf OCS operations (Fig. 4). The most frequently mentioned locations are Yakutat, Anchorage, Cordova, Icy Bay, Middleton Island, and Kayak Island. Other sites mentioned are Valdez, Montague Island, Seward, Kenai, Kodiak and Juneau. In selecting onshore support sites, industry is looking for locations which have deep harbors, flat adjacent uplands and close proximity to offshore operations and transportation facilities.[37] Alaska's Department of Community and Regional Affairs has identified potential industrial sites adjacent to both the northern and western Gulf of Alaska lease sales. Their data, presented in Table 4 and Figure 4, shows Yakutat Bay, Icy Bay, Cordova, and Resurrection Bay as being the best sites for locating OCS support facilities resulting from northern Gulf operations.[38]

More impact information is available for the northern Gulf than for any other leasing area in Alaska; yet, even here the amount of hard data

Figure 4. Location of potential support sites adjacent to Gulf of Alaska lease sale area (Numbered sites are identified in Table 4) (Source: Alaska Department of Community and Regional Affairs[37]).

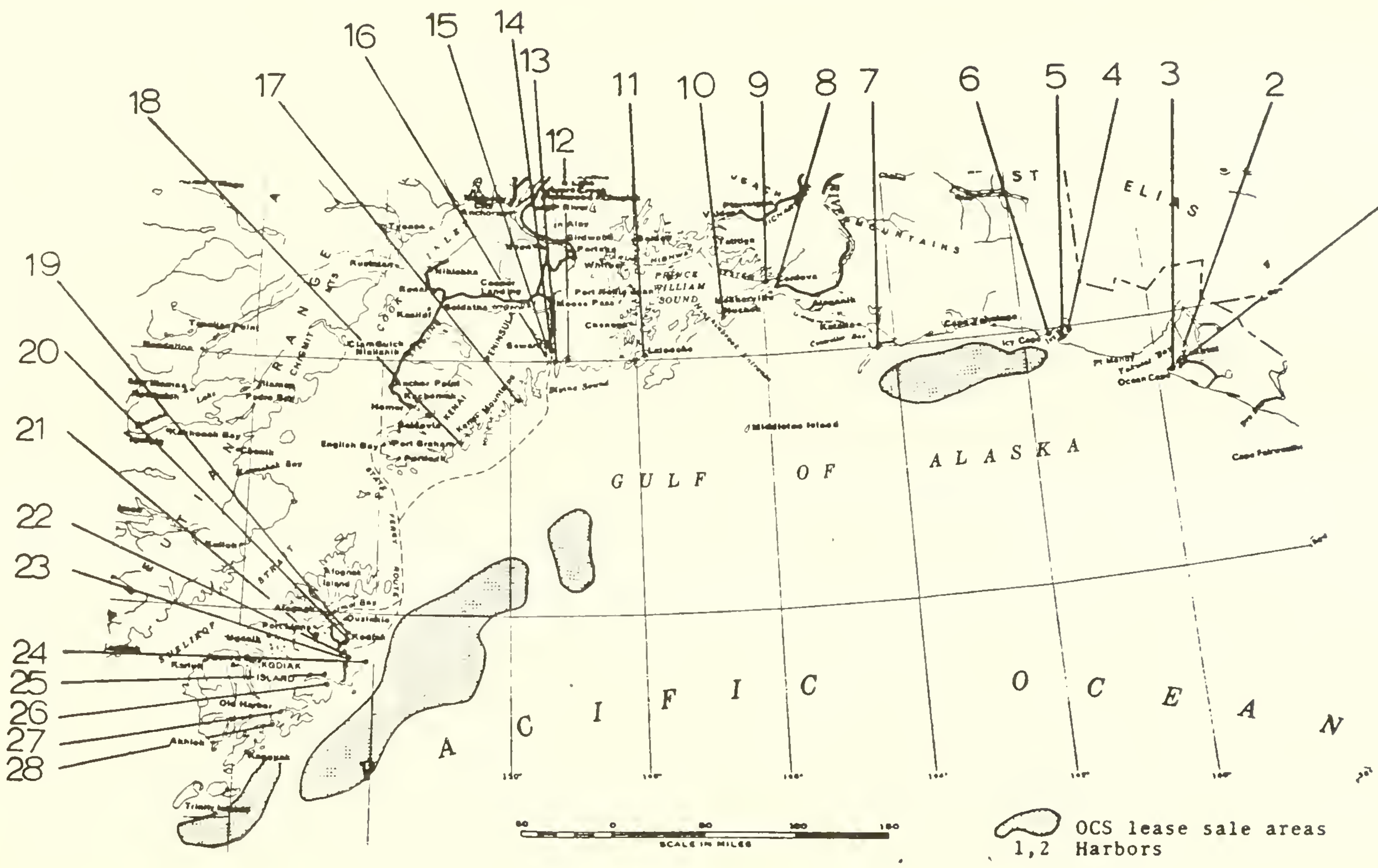


Table 4. Analysis of Potential Industrial Sites Adjacent to Gulf of Alaska (Source: Alaska Department of Community and Regional Affairs[37])

● Yes

O No

FACILITIES	Supply and Service Base											Pipecoating			Terminals									Concrete Platform Fabrication					
		Harbor Conditions						Road/ Shuttle							Crude and LNG				Crude	LNG				Harbor Conditions					
		Water Depth																						Water Depth					
CRITERIA	Proximity to Offshore Activity	Quayside	Harbor	Waterfront	Turning Basin (diameter)	Sheltered	Level Land Adjacent to Dock	To Community	To Airport	Industry Interest	Local Interest	Near Supply Base	Level Land Adjacent to Dock	Waterfront	Harbor Depth	Turning Basin (diameter)	Sheltered	Waterfront	Acreage Adjacent to Dock	Acreage Adjacent to Dock	Max Distance from LNG Plant	Acreage for LNG Plant	Downwind from Other Developments	Nearshore	Outer Harbor	Towing Route	Harbor Width	Sheltered	Access to Aggregate
POTENTIAL INDUSTRIAL SITES	200 mi.	20'	30'	2000'	1500'		20-50 ac.						90-100 ac.	1000'	50'-70'	3000'-4500'		4000'-8000'	300	120	2.5 mi	450		140'-300'	750'	128'	3000'		
1. Yakutat Bay - Redfield Cove	●	●	●	●	●	●	●	O	O		O	O	●	●	●	●	●	●	●	●	●	●	●	●	O	O	●	●	●
2. Yakutat Bay - Broken Oar Cove	●	●	●	●	●	●	●	●	●		O	●	●	●	●	●	●	●	●	●	●	●	●	●	O	O	●	●	●
3. Yakutat Bay - Monti Bay	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	O	O	O	●	●	●
4. Icy Bay - Lower Chaix Hills	●	●	●	●	●	●	●	O	O			O	●	●	●	●	●	●	●	●	●	●	●	●	O	O	●	●	●
5. Icy Bay - Gull Island	●	●	●	●	●	●	●	O	O		●	O	O	●	●	●	●	●	●	●	●	●	●	O	O	O	●	●	●
6. Icy Bay - Icy Cape Foreland	●	●	●	●	●	O	●	O	O			O	●	●	●	●	O	●	●	●	●	●	●	●	O	O	●	O	●
7. Controller Bay - Kayak Island	●	●	●	●	●	O	●	O	O			O	O	●	●	●	O	●	●	●	●	●	●	O	O	●	●	O	O
8. Prince Wm Sound - Cordova	●	●	●	●	●	●	●	●	●			●	O	●	O	O	●	O	O	O	O	O	●	O	O	O	O	●	O
9. Prince Wm. Sound - Hawkins Island	●	●	●	●	●	●	●	O	O			O	●	●	●	●	●	●	●	●	●	●	●	●	O	●	●	●	O
10. Prince Wm. Sound - Port Etches	●	●	●	●	●	●	●	O	O			O	●	●	●	●	●	●	●	●	●	●	●	●	O	●	●	●	O
11. Prince Wm. Sound - Latouche	●	●	●	●	●	●	●	O	O	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	O
12. Blying Sound - Day Harbor	●	●	●	●	●	O	●	O	O			O	●	●	●	●	O	●	●	●	●	●	●	●	O	●	●	O	●
13. Resurrection Bay - Thumb Cove	●	●	●	●	●	●	●	O	O			O	●	●	●	O	●	O	●	●	O	O	●	●	●	●	●	●	●
14. Resurrection Bay - Fourth of July Creek	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
15. Resurrection Bay - Seward	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
16. Resurrection Bay - Lowell Point	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
17. Kenai Peninsula - Harris Bay	●	●	●	●	●	O	●	O	O			O	●	●	●	●	O	●	●	●	●	●	●	●	O	●	●	O	O
18. Kenai Peninsula - Nuka Passage	●	●	●	●	●	O	●	O	O			O	●	●	●	●	O	●	●	●	●	●	●	●	●	●	●	O	●
19. Kodiak - Monashka Bay	●	●	●	●	●	●	●	O	O			O	●	●	●	●	●	●	●	●	●	●	O	●	O	●	●	●	O
20. Kodiak - St. Paul's Harbor	●	●	●	●	●	●	●	●	●			●	O	O	O	O	●	O	O	O	O	O	●	O	O	O	O	●	O
21. Kodiak - Kizhuyak Bay	●	●	●	●	●	●	●	O	O			O	●	●	●	●	●	●	●	●	●	●	O	O	O	●	●	●	O
22. Kodiak - Middle Bay	●	●	●	●	●	●	●	●	●			●	●	●	O	O	●	●	O	●	O	O	●	O	O	●	●	●	O
23. Kodiak - Kalsin Bay	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	O	●	●	●	O
24. Kodiak - Cape Chiniak	●	O	O	O	O	●	●	●	●		●	●	●	O	O	O	●	O	●	●	●	●	●	O	O	●	O	●	O
25. Kodiak - Ugak Bay, Saltery Cove	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	O	●	●	●	O
26. Kodiak - Ugak Bay, Eagle Harbor	●	●	●	●	●	●	●	O	O			O	●	●	●	●	●	●	●	●	●	●	●	●	O	●	●	●	O
27. Kodiak - Old Harbor	●	●	●	●	●	●	●	●	●			●	O	●	O	O	●	O	O	●	O	O	●	O	O	●	●	●	O
28. Kodiak - Barling Bay	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	O	●	●	●	O

[Note: Linked symbols (●-●-●) indicate that the specified site is considered a candidate for the designated facility.]

available concerning potential impacts is small and unsatisfactory. Most information concerning OCS impacts has come from two studies, BLM's environmental impact statement and Mathematical Science's report prepared for the Gulf of Alaska Operator's Committee.

Exploration of the northern Gulf OCS is expected to take from 4 to 7 years. During this period storage depots, work cargoes, port facilities and roads will be constructed onshore. Peak employment levels should reach 1,000 to 2,000 jobs and occur in 1978 or 1979. Because petroleum personnel work 2-week shifts most new employees will probably live in the Anchorage area. But several hundred employees may settle in the small coastal towns adjacent to offshore activities. Even a population increase of this size will strain the capabilities of towns like Yakutat to provide necessary public services. Exploration activities will also increase land prices, affect small community lifestyles, and increase pressures on fish, wildlife and recreational resources.

Pollution from exploratory drilling will occur from discharges of muds, drill cuttings, and petroleum. There is also risk of well blowouts given the harsh climate, and earthquake hazards of the region. Marine and terrestrial wildlife will be affected by disturbances from seismic blasting and pollution from sewage, solid wastes, and oil spills.[39]

The risk of well blowouts and offshore impacts from the discharge of drilling muds and cuttings will increase during the development phase when from 900 to 1,800 development wells will be drilled. The discharge of drilling muds and cuttings may damage the marine environment by increasing turbidity, smothering benthic life, and contaminating lower organisms of the food chain.

The development phase will see a sharp increase in onshore activity and construction operations. BLM's final impact statement predicts the

construction of from 3 to 8 support/supply installations, one LNG plant and one loading facility but Alaskan officials feel these estimates are too low given the Bureau's assumptions about petroleum production. State officials believe twice as many facilities may be built.[40]

Direct employment will peak during the development phase at from 2,000 to 4,000 workers around 1985. Major increases in population will occur in the small towns along the Gulf even though the majority of newcomers (over 60 percent) will settle in Anchorage. Population increases will be even greater if concrete platforms are used instead of steel platforms (about 1,000 workers per platform constructed).

This large influx of population will severely strain the financial and planning capabilities of adjacent coastal communities. The infrastructures of these towns are primitive and ill-equipped to accomodate a doubling or tripling of the present census. Boom town conditions may lead to runaway inflation, housing shortages, poor sanitary conditions, increases in the crime rate, considerable traffic congestion, and displacement of established activities. Similar impacts have occurred in Valdez and Fairbanks as a result of the trans-Alaskan pipeline.

State and local governments will need considerable sums of money to provide important municipal services. An Alaskan Department of Revenue study concluded that the northern Gulf of Alaska lease sale will cost each resident of the state between $271 and $304. The 20-year cash-flow model used in the report indicated that the state would receive benefits only during a 7-year period starting in 1985. Before 1985 and after 1991, the model showed 22 years of net losses to Alaska from OCS development.[41]

OCS activities may interfere with the large Gulf of Alaska fishing industry. Biological resources may be reduced as a result of oil spills and habitat destruction. Commercial and sport fishing activities may be curtailed by the presence of platforms and there may be a risk of nets fouling on various obstructions. Further, the existence of well-paying petroleum-related jobs may depress the commercial fishing industry and associated ways of life. Competition for port facilities may lead to a migration of fishing vessels out of areas active with OCS support vessels to more remote ports.

Alaskan Natives are greatly concerned about cultural impacts resulting from OCS operations. Subsistence and smalltown lifestyles may be threatened by OCS operations. Native political and economic power now being asserted and consolidated under the Native Claims Settlement Act may be thwarted by large numbers of newcomers who hold different social values and beliefs.

Substantial habitat destruction may result from dredging and filling operations for harbor modifications, pipeline installations and residential and industrial development. Considerable amounts of gravel will be required for most kinds of onshore construction which will entail further dredging.

Employment during the production phase is expected to stabilize at from 1,200 to 2,500 jobs until the fields are depleted. These cutbacks from peak development phase employment could lead to unemployment and fiscal problems for local communities.

Tanker traffic will increase during the production phase and become a prime source of oil spills. Oil spills may also result from blowouts,

pipeline breaks, platform fires, storage tank failures and casing leaks. The Bureau of Land Management has estimated that 43,873 barrels of oil will be spilled annually in the Gulf. Many state officials and environmentalists fear the figure will be higher. In addition, they fear the occurrence of massive oil spills resulting from the regions' stormy weather and active seismic conditions. The counter clockwise direction of the Alaska Current makes it very likely (particularly in the summer) that much of this oil would reach the shoreline. Wildlife in the area particularly vulnerable to acute and chronic oil spills include the peregrine falcon, trumpeter swan, dunlin, Aleutian tern, Glacier (black) bear, brown bear, Dusky Canadian goose, rock ptarmigan, osprey, sea otter, fur seal, sea lion, and bald eagle. Oil spills would also cause air pollution and inhibit recreational activities.

In addition to these OCS impacts, two other major projects in the Northern Gulf may significantly affect the region. They are a liquefied natural gas (LNG) plant and marine terminal proposed by the El Paso Alaska Company at Gravina Point in Prince William Sound and the terminus of the trans-Alaska oil pipeline at Valdez.[42] The proposed LNG plant and auxiliary facilities would require 1,200 acres of land and take 7-years to build. Construction impacts from this facility would be substantial; for example, by 1979 Cordova's population is projected to increase by over 8,000 new residents as a result of activity from both the northern Gulf lease sale and the LNG terminal.[43]

Once the Alaska Pipeline is completed, from 1.2 to 2.0 million barrels per day (bpd) of crude oil will be shipped by tankers from Valdez to the West Coast. Twenty tankers with deadweight tonnage of 1,390,000 tons

and a turn-around time of 14.5 to 15.5 days will be required to transport the initial 1.2 million bpd of crude oil. Tanker traffic and congestion will increase even more if the El Paso LNG proposal is approved. The transportation of LNG may create a significant safety hazard due to the highly flammable nature of the substance.[44]

OCS impacts will not disappear when the oil fields stop producing. Excess infrastructure capacity will exist and welfare transfer payments are likely to increase. Per capita income levels could fall as unemployment levels grow. Wildlife, fish, and marine life damaged by OCS related activities will be slow to repopulate to former numbers. Sea life, in particular, will probably be impacted for years after production has ceased due to the persistence of oil in the environment.

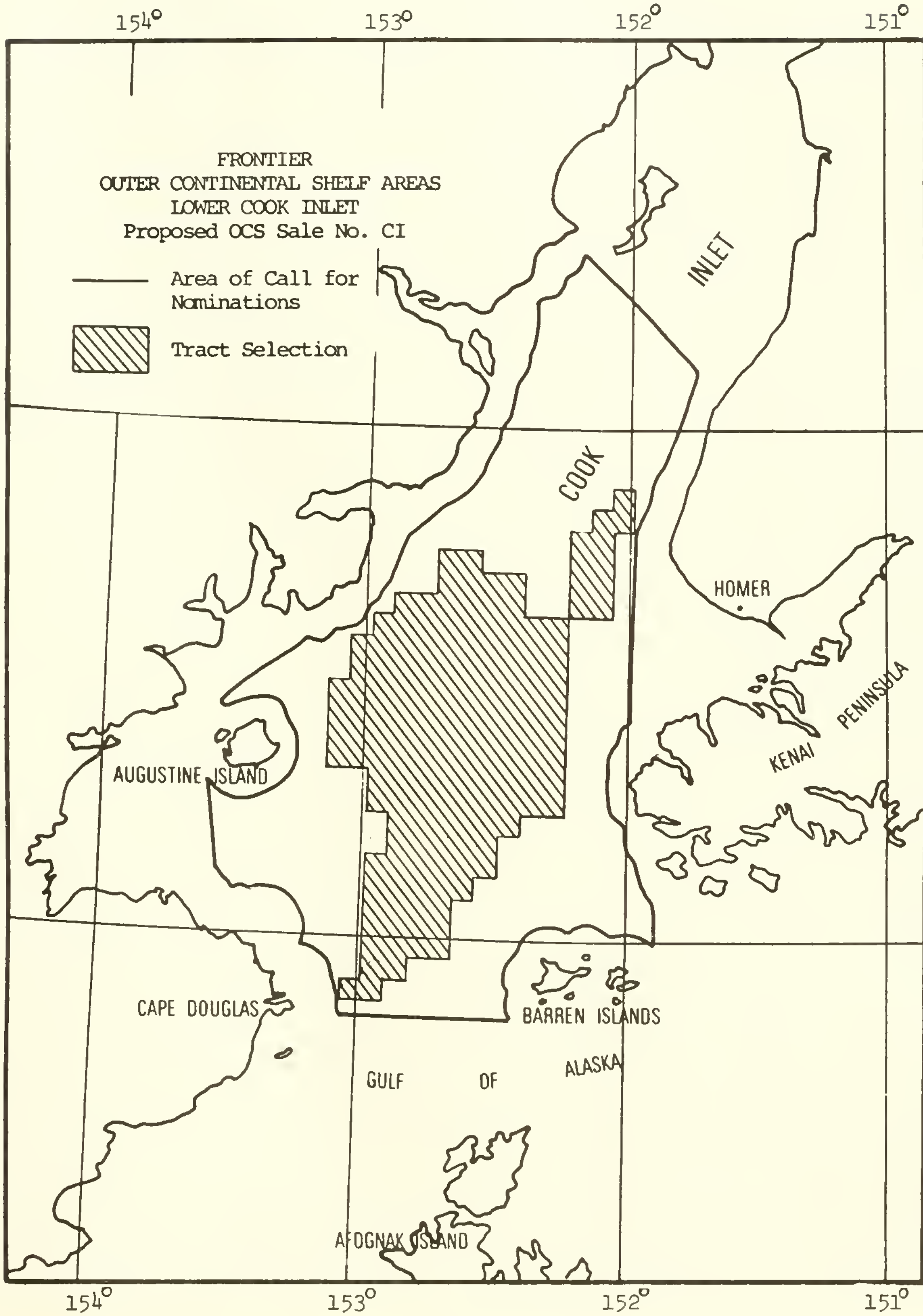
Many local communities and native citizens living on the northern Gulf do not want OCS operations to occur because of the many environmental and social costs of OCS development.[45] Some communities, however, have indicated an interest in accommodating the oil industry. Two, in particular, are Cordova and Juneau.[46]

5.2.3 Lower Cook Inlet

Description of the Region[47]

Located in southcentral Alaska, Cook Inlet is a large tidal estuary which flows into the Gulf of Alaska (Fig. 5). This estuary is shallow, averaging only 200 ft. deep. Cook Inlet is surrounded on three sides by four major mountain ranges. Five active volcanoes border the inlet to the west making tsunamic and volcanic risk a problem. Earthquakes are also a hazard.

Figure 5. This is the proposed sale lease area for the lower Cook Inlet estuary (Source: BLM Lower Cook Inlet Draft EIS).



Sea state within the inlet is a factor of tidal currents and wind rather than storm tracts and sea currents. The area has some of the fastest tidal currents and most extreme tides in the world. Seas can often be steep and rough when currents run opposite the wind.

King and tanner crab are abundant in lower Cook Inlet with major concentrations approximately midway between Augustine Island and the Barren Islands (Fig. 5). The dungeness crab also inhabits the area. Five species of shrimp are commercially abundant with largest concentrations found in Kachemak Bay and midway between Augustine Island and the Barren Islands. Scallops also are found in the same waters in midinlet. Halibut inhabit the lower inlet from May through August, and all five species of Pacific salmon utilize streams entering Cook Inlet for spawning. Major sockeye salmon spawning systems are the Kenai-Russion, Kasilof, Susitna Rivers and Fish Creek.

Approximately 105 species of birds have been observed in Cook Inlet and along the shores. Most abundant are fulmars, scoters, eiders, black-legged kittiwakes, tufted puffins, glaucous-winged gulls and common murres. Several species of marine mammals also inhabit the inlet including sea otters, seals, steller sea lions, killer whales, porpoises and beluga whales.

The Cook Inlet region has Alaska's most diversified and developed economy. Anchorage, at the head of the inlet, is the government, military and economic center of Alaska. Homer, Kenai and Soldotna are important subregional centers of population and commerce and have large non-Native populations (Fig. 2). Kenai is an important industrial center based on Cook Inlet oil and gas. Port Graham, Seldovia, English Bay, Ninilchik

and Kasilof are predominantly Native villages, consisting of Tanaina Indians and Chugach Eskimos. These villages have a mixed economy; commercial fishing for crab, shrimp and salmon, as well as tourism are very important.

Petroleum Resources

Geologically, the lower portion of Cook Inlet is similar to the upper portion[48] where four offshore oil fields and one onshore field have yielded almost 0.6 billion barrels of oil and 1.6 trillion cubic feet of gas.[49] This may explain why industry interest in Federal (and state) leasing initiatives in the area has been so keen.[50] The U.S. Geological Survey has estimated minimum and maximum recoverable oil and gas resources within the proposed sale areas at from 0.9-2.6 billion barrels of oil and from 0.6 to 3.3 trillion cubic feet of gas. Translating these figures into crude market values using $11 a barrel oil and 0.95 MCF gas resource values will vary between 0.99 to 28.6 billion dollars for oil and 0.57 to 3.1 billion dollars for gas.[51]

Status of OCS Operations

The Bureau of Land Management has scheduled two lease sales for lower Cook Inlet. The first will be held in February 1977 (Fig. 5) and the second will occur in August 1980.

Since the June 1975 Supreme Court decision awarding lower Cook Inlet to the Federal government the BLM has moved quickly to offer the inlet for sale. In September of 1975, the Bureau of Land Management called for nominations on about 450 tracts covering 2.3 million acres and received a heavy response from the oil industry.[52] But state and

Federal agencies, local communities and commercial fishing organizations opposed the leasing of more than half of these offshore lands.[53] In March of 1976 the BLM selected 152 tracts totalling 865,364 acres for oil and gas lease sale in lower Cook Inlet.[54] A draft EIS was prepared by July of 1976 and the final EIS is due out the end of the year.

Detailed exploratory data has not yet been collected by industry for lower Cook Inlet. At least two offshore drilling proposals have been made by industry to improve the geological data. Exploration Services proposes to drill a 12,000 ft. COST well in 532 feet of water at 14^{o}s-22^{o}w and ARCO proposes to drill a COST well southeast of St. Augustine Island. The purpose of the offshore drilling work would be to develop stratigraphic information in previously undrilled territory.[55]

In contrast with the northern Gulf sale, state officials agree with the Interior Department officials on a 1977 lease sale in lower Cook Inlet. Although state officials are concerned about OCS development in the Inlet, they believe that the environmental and socio economic problems of the lower Cook Inlet are less severe than in the Gulf. In addition experience with offshore petroleum in upper Cook Inlet has shown that industry can operate safely in the area.[56] Finally, some offshore pipelines, refinery and LNG facilities are already present or proposed onshore.

Environmental and Socioeconomic Impacts[57]

The only comprehensive impact study done to date for lower Cook Inlet has been BLM's draft environmental impact statement. This EIS is is thorough and presents more useable data than the northern Gulf statements. Alaska officials, in general, found this EIS to be superior

to the northern Gulf statements. Although state reviewers pointed out gaps and contradictions in the analysis, they generally concurred with the employment and population projections given BLM's assumptions about petroleum production.[58]

As with the northern Gulf EIS, BLM assumed high petroleum finds for purposes of their impact analysis. The Bureau estimated that the sale area would produce 2.6 billion barrels of oil and 3.3 trillion cubic feet of natural gas. They assumed peak production volumes for oil at 930,000 barrels/day and 465 million cubic feet/day for gas. Oil production will peak in 1984, natural gas production will peak from 1986 to 2000.[59] According to USGS there is only a 5 percent probability of recovering this much petroleum.

Additional estimates of the rate and type of development are also made by BLM and these are shown in Tables 5 and 6. Assumptions for the for the lower Cook Inlet are:

(1) At peak production, 23 platforms would be required, 21 oil platforms and 2 gas platforms.

(2) There would be 84 exploratory wells, 80 service wells, and 440 production wells drilled.

(3) There would be pipelines totalling 300 miles in length, of which 100 miles would be constructed onshore and 200 miles would be submarine.

(4) No petroleum refineries or platforms would be constructed in Alaska as a result of the sale.

(5) Natural gas would be marketed and there would be one liquified natural gas (LNG) plant constructed around 1984.

Table 5. Schedule and Summary of Estimated Investments and Production for the Lower Cook Inlet Lease Area (all costs are total and expressed in millions of dollars) (Source: BLM Lower Cook Inlet Draft EIS)

Year	Exploratory Wells[1] Number/cost		Platforms and Equipment Set[1] Number/cost		Development Wells[1] Number/cost		Onshore Treatment Facilities[1] Number/cost		Large Pipelines[1] Miles/cost		Terminals Onshore[1] No./cost		Terminals LNG Plant[2] No./cost		Total Investment Costs	Production Oil Mil bbls	Production Gas Bil cf
1977	5	25-35													25 - 35		
1978	11	55-77													55 - 77		
1979	21	105-147													105 - 147		
1980	21	105-147	3	150-450	30	60-90			75	75-150					390 - 837		
1981	11	55-77	3	150-450	60	120-180	1	25	75	75-150	1	50-75			475 - 957	40	
1982	8	40-56	6	300-900	120	240-360			60	60-120					640 - 1436	120	25
1983	4	20-28	6	300-900	130	260-390	1	25	45	45-90	1	50-75			700 - 1508	220	40
1984	3	15-21	3	150-450	90	180-270			45	45-90			1	682	1072 - 1513	340	65
1985			2	100-300	50	100-150									200 - 450	290	130
1986					20	40-60									40 - 60	250	170
1987					20	40-60									40 - 60	210	170
1988																180	170
1989																160	170
1990																130	170
1991																110	170
1992																100	170
1993																80	170
1994																70	170
1995																60	170
1996																50	170
1997																42	170
1998																38	170
1999																32	170

Continued next page

Table 5 (continued)

Year	Exploratory Wells[1] Number/cost	Platforms and Equipment Set[1] Number/cost	Development Wells[1] Number/cost	Onshore Treatment Facilities[1] Number/cost	Large Pipelines[1] Miles/cost	Terminals Onshore[1] No./cost	Terminals LNG Plant[2] No./cost	Total Investment Costs	Production Oil Mil bbls	Production Gas Bil cf
2000									28	170
2001									22	130
2002									18	120
2003									10	110
2004										75
2005										50
2006										
2007										
TOTALS	420-588	1150-3450	1040-1560	50	300-600	100-150	682	3742-7080		

1 USDI 1976a.

2 Dames & Moore 1974 and (viva voce) K. McKinney, Pacific Alaska LNG Co., April 29, 1976.

Table 6. Summary of Basic Assumptions Regarding Lower Cook Inlet Oil and Gas Production (Source: BLM Lower Cook Inlet Draft EIS)

Activity	This Proposed Sale
Sale acreage offering	865,000 acres (350,000 hectares)
Anticipated sale	692,000 acres (280,000 hectares)
Recoverable oil (maximum)	2.6 billion barrels 1/
Recoverable gas (maximum)	3.3 trillion cubic ft. 1/
Peak production oil	930,000 bbls/day 1/ 340 million bbls/year 1/
Peak production gas	465 million cf/day 1/ 170 billion cf/year 1/
Platforms	23 (21 oil; 2 gas) 1/
Wells	604 (84 exploratory; 80 service; 440 production)
Pipelines	300 miles (200 miles offshore; 100 miles onshore 1/
Pipeline burial excavation volume	3000 to 8000 yards/mile 1/
Onshore pipeline acreage required	630 acres (255 hectares) permanent right-of-way
Onshore oil terminal facilities number and acreage required	2; 240 acres (97 hectares); 120 acres (49 hectares) each 1/
Support/supply facilities number and acreage required	3; 120-240 acres (49-97 hectares); 40-80 (16-32 hectares) each 1/
LNG plant and terminal	1; 60-120 acres (24-49 hectares)
Production treatment facilities	2; 160 acres (65 hectares); 80 acres (32 hectares) each
Total direct land requirements	1339-1519 acres (542-615 hectares)
Petroleum refineries	0 1/
Platform fabrication	0 1/
Supply and support boats	6-24
Annual crude shipped by tanker	Up to 340 million bbls/year 1/

1/ - USDI 1976

(6) The fleet required to support and service the offshore rigs would range from 3 to 18 boats during exploration to about 21 boats during the peak development phase.

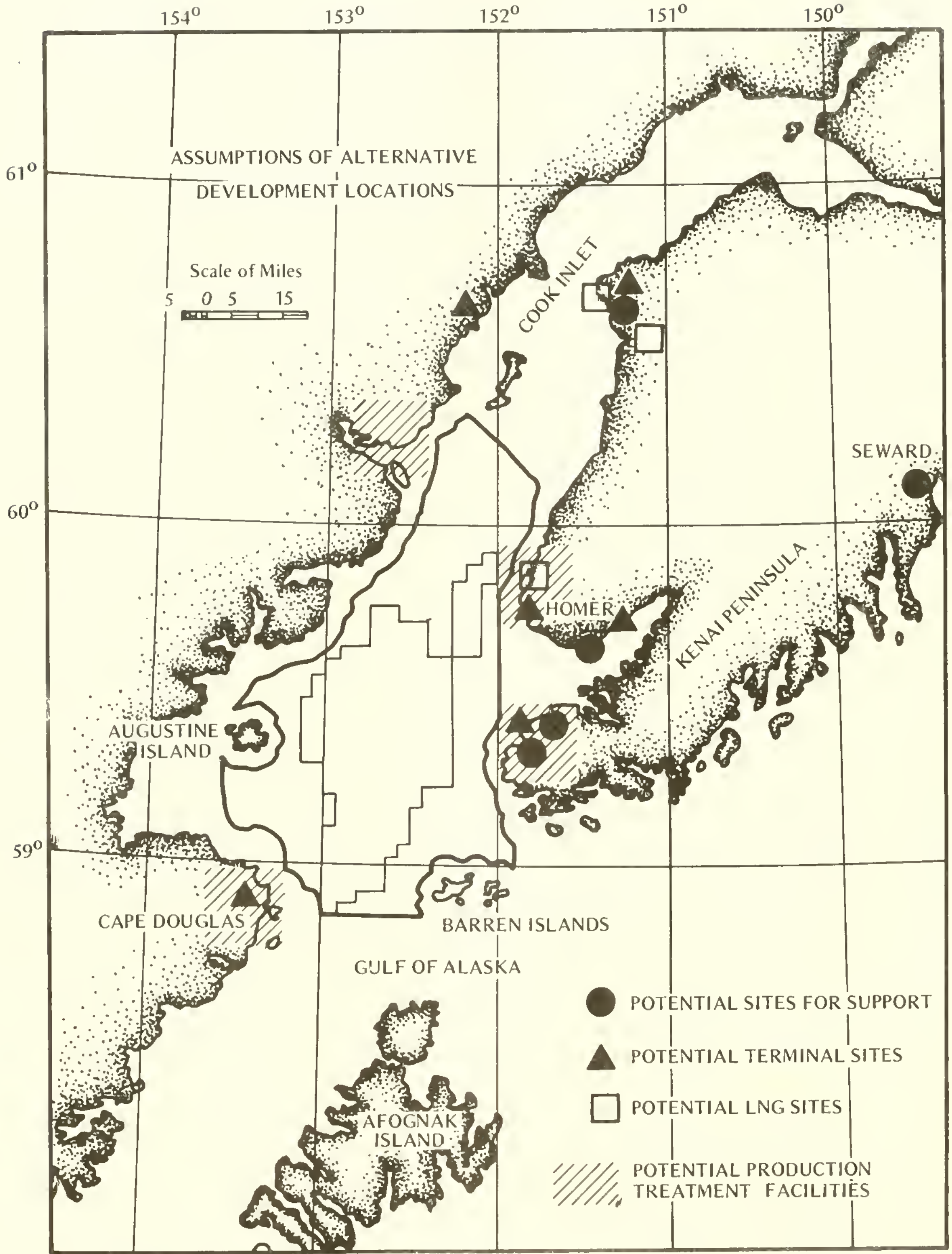
(7) Total onshore land requirements would be from 1,339 to 1,519 acres.

(8) Two new onshore terminals and two production treatment facilities would be constructed. The remaining petroleum production would be handled by existing facilities.[60]

The location of support and supply facilities, crude oil terminal sites, and onshore production treatment facilities in lower Cook Inlet will depend upon the location of producing oil and gas fields. Potential support and supply facilities will likely be sited in the Homer, Kenai, the Seldovia-Port Graham areas, and at Seward (Fig. 6). Potential crude oil terminal and treatment facilities will likely be located in the Seldovia-English Bay-Port Graham area and in the Cape Douglas area for discoveries in the southern part of the lease sale area. For discoveries in the northern part of the sale area, crude oil terminal and treatment facilities will probably be located in the Anchor Point area and on the west side of the Inlet. Present terminal and storage facilities at Nikinki and Drift River may also be used if oil and gas is produced in the northern part of the leasing area. A proposed (by Pacific Alaska LNG Co.) LNG facility near Kenai could also be used to transship lower Cook natural gas.

There will be substantial increases in population and employment resulting from the development of lower Cook Inlet petroleum resources. Particularly hard hit will be the small towns and villages located in

Figure 6. Potential support and supply sites for oil and gas related activities in lower Cook Inlet area (Source: BLM Lower Cook Inlet Draft EIS).



the Kenai-Cook Inlet area. Population in this region will increase 50 percent (or 10,882) by 1983 as the result of OCS development in lower Cook Inlet. Local and state finances will probably be hard put to meet subsequent demands for more schools, housing and social services. A large number of social and cultural impacts may occur including an increase in crime, a change in smalltown and rural atmosphere, and an alteration of native subsistence culture. Competition for ports, land, and labor is likely to be acute during the development boom, particularly between the fishing and oil industry.

A significant portion of the projected increase in population and employment will occur in the Anchorage area (about 5,100 by 1983). This will add to the already fast growth rate of the region. However, while employment and population increases will be large in absolute numbers, they will be small in comparison to the size of Anchorage's labor pool, population and infrastructure. In 1983, the Anchorage area is projected to have a total population of 261,000 and a workforce of 127,000.

Projected employment and population increases from lower Cook Inlet development are similar to the increase that occurred during the development of upper Cook Inlet fields in Alaska. During 1964 to 1972 the Kenai and Seldovia areas underwent major economic and cultural changes. Regional employment increased rapidly by 73 percent from 1966 to 1968 and significant in-migration occurred during the development boom. However, the economic boom disappeared as rapidly as it appeared. After the completion of major offshore development and onshore construction activities, petroleum employment decreased substantially and from 1970 to 1971

unemployment levels increased in the region. In short, upper Cook Inlet experienced an intense but temporary boom in development drilling and construction activity.

Coastal and marine ecosystems will be degraded by acute and chronic oil spills and onshore development and operation activities. Fish and wildlife will primarily be affected by: (1) pollution, (2) habitat destruction, and (3) increased sport fishing and hunting pressures.

BLM estimates that 71,600 barrels of crude oil will be spilled during the height of oil production activity in the lower Cook Inlet and along the transport route (Table 7). Oil spill trajectory analysis shows that large amounts of oil will reach coastal and onshore habitats. A worst case scenario would be a large oil spill reaching the shoreline during the growing season in one day. Damage would be especially significant in the Bluff Point area, the south eastern margins of the Kenai Peninsula, Chinitna Bay to Tuxedni Bay, and Kachemak Bay.

Sea otters, fur seals and sea lions will be quite susceptible to oil pollution and human disturbance impacts. The installation of offshore platforms, pipelines, and the noise associated with supporting aircraft and vessel traffic may cause abandonment of traditional fur seal, sea lion or sea otter breeding grounds. A major spill during pupping season could eliminate large numbers of sea lions and harbor seals. In addition, local populations of commercially valuable otters, mink, muskrat and beaver will be vulnerable to oil pollution because they use aquatic systems for foraging, transportation, and refuge.

Sea otters will be the most vulnerable marine mammal in lower Cook Inlet to impacts resulting from OCS development. According to Dame's

Table 7. Anticipated Annual Oil Spillage During Peak Production Resulting from the Proposed Sale (Sources: CEQ 1974, Lower Cook Inlet Draft EIS)

Location	Sources	Maximum Annual Spillage (Barrels)	Cumulative 25 Year Total (Barrels[a])
Lower Cook Inlet	Pipeline accidents	5,800	48,000
	Formation Water*	780	19,500
	Spills from Platform Fires	9,900	82,000
	Overflow, malfunction, or rupture	185	1,500
	Minor spills (less than 50 bbls-all sources	550	13,750
	Subtotal	17,215	164,750
Transportation Route	Tankers	54,400	450,000
	Total	71,615	614,750

[a] The cumulative totals are not based on peak year production spillage rates, but on the yearly projected production.

and Moore's oil spill trajectory analysis there is a 99 percent chance that oil spills originating within the proposed leasing area will impact sea otter concentrations on the Kenai Peninsula, Barren Islands, and Kachemak and Kamishak Bay areas. Further, potential marine support facilities on the tip of the Kenai Peninsula and Cape Douglas will very likely eliminate critical habitat and concentrations of sea otters because of human disturbances and chronic oil pollution.

But the greatest threat to wildlife from oil spills and human disturbance will be to the 40 to 50 species of diving birds, colony nesting birds, and water roosting birds in the area. Coastal bird habitats that will be most threatened by oil pollution are Augustine Island, Stevenson Entrance, the Barren Islands, and the area from Tuxedi Bay to Iliamna Bay. Dames and Moore oil spill trajectory analysis shows that there is a 100 percent chance that oil spills originating within the proposed lease sale area will impact marine bird nesting, resting or foraging areas. Birdlife will be most vulnerable to oil spills during the summer nesting season and during spring and fall migration periods.

Oil spills will also negatively affect coastal fisheries and their associated marine ecosystems. Acute and chronic spillage of oil would decrease local finfish populations and salmon and herring spawning areas. Also shallow subtidal filter feeding invertebrates such as clams will be affected by petroleum hydrocarbons. The most vulnerable clam populations, primarily razor clams, exist in the Clam Gulch and Polly Creek areas. There is also a strong possibility that commercially valuable populations of king, snow and dungeness crab will be reduced by activities associated with OCS development. Egg and larval forms will be the most susceptible to oil pollution.

BLM's EIS did not explain, in detail, potential impacts, resulting from secondary development. Large population increases will stimulate commercial, residential, and public utility development. Dredging, filling, and effluent discharges from these activities may result in greater impacts than those arising from oil pollution and habitat destruction from primary petroleum activities. In addition OCS development may act as a stimulus for much greater regional growth in the future. This would probably greatly alter the character and environment of the area.

5.2.4 Western Gulf of Alaska

Description of the Region[61]

The western Gulf of Alaska extends from Middleton Island south of Prince William Sound to the south side of the Kodiak Island archipelago. The coastal region encircling the western Gulf of Alaska typically is rugged with a fjord-indented coastline. Few narrow beaches interrupt the generally steep, rocky shore. However, along the southwestern part of Kodiak Island the coastline is relatively smooth with no major fjord indentations.

The coastal zone from Prince William Sound westward is prone to frequent and severe earthquakes. During the last 70 years, eight seismic events have equalled or exceeded a magnitude of 8.

Circulation in the western Gulf of Alaska is generally westward, influenced by the counterclockwise gyre in the gulf proper. Surface currents are influenced greatly by strong winds associated with frequent

storms in the gulf and by tidal action, particularly in nearshore areas. Heavy rip-tides occur at many points along the coast, particularly adjacent to the Kodiak Islands.

The marine waters and associated continental shelf of the western Gulf of Alaska are among the most productive in the North Pacific. This area supports major fisheries for king, dungeness, and tanner crabs; shrimp; and a variety of bottomfish, including Alaska pollock, Pacific cod, blackcod, Pacific halibut, and a variety of other flatfish. Waters over the shelf also abound with Pacific salmon and all five species are found in abundance. Spring and summer freshwater runoff and offshore upwelling are primarily responsible for the great productivity of the region. Shorelines and tidal flats also provide extensive habitats for intertidal plants and animals.

Many species of marine birds pass through the region in spring, migrating to nesting grounds in northern Alaska. In addition, at least 24 seabird colonies have been identified adjacent to the proposed lease area in the western Gulf. Major colonies exist at Boulder Bay and Chiniak Island. Black-legged kittiwakes and tufted puffins are the most abundant, with glaucous-winged gulls, cormorants and pigeon guillemots the next most common. Many thousands of ducks also assemble along the shoreline during the winter.

Critical marine mammal habitat enclosed or bordering the proposed lease area include at least 13 sea lion rookeries and hauling grounds, with a maximum herd of over 15,000 individuals reported for Marmot

Island. Sea otter populations are also present, with primary concentrations in the Perenosa Bay area and east of Shuyak Island. Harbor seals and harbor porpoises, Dall porpoises and killer whales are also common.

The city of Kodiak (population 9,000) is the major center of population, commerce, trade, and transportation of the region, and has a large non-Native population. Some 15 outlying Eskimo communities along the coasts and islands have varying degrees of social and economic dependence on the city and are served by tranportation based in Kodiak. Fish and shellfish harvesting and production exceed that of any other industry and strongly affect the pattern of community development. The importance of the fishing industry, with its inherent seasonality, is one reason for the relatively high unemployment in the region.

Petroleum Resources

The USGS has yet to issue estimates of undiscovered recoverable petroleum resources for the western Gulf of Alaska, but Alaska's Department of Natural Resources (DNR) has forecast high and low scenarios for the region. For the low scenario, DNR calculated a figure of 372 million barrels of oil and 2.3 billion cubic feet of gas and for the high scenario, DNR estimated 2.5 billion barrels of oil and 8 trillion cubic feet of gas. The Department did not specify the probability of either scenario.[62]

Status of OCS Operations

BLM will make the western Gulf the third frontier area leased off Alaska in November of 1977. This sale may offer as much as 3 million acres off the east coast of Kodiak Island. Before any sale can take

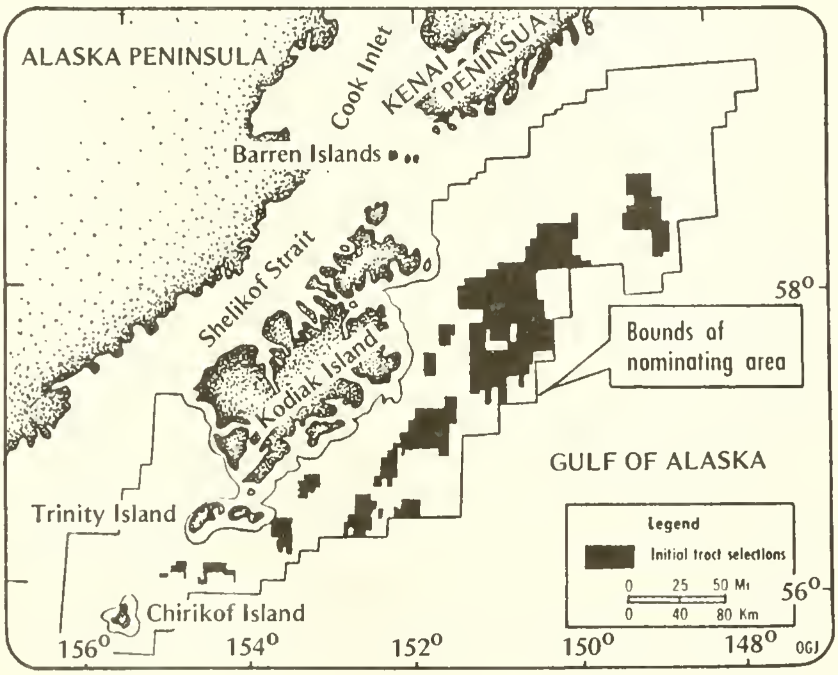
place, though, the BLM will have to complete and circulate the environmental impact statement they are currently working on for this area. A second sale is scheduled to be held in December of 1980.

In May of 1976, BLM tentatively selected 564 tracts totalling about 3.17 million acres for leasing in the western Gulf (Fig. 7). The list of 564 was picked from an original department call that included 2,915 tracts covering about 16 million acres of which industry had nominated 12.8 million acres. The selected tracts lie in an area south and east of Kodiak Island and southwest of Montague Island. They range from 4 to 115 miles offshore in an area about 430 miles long and 60 miles wide in waters from 90 to 900 feet deep.[63]

Alaskan officials submitted negative nominations for three areas they considered environmentally sensitive--Albatross Bank, Marmot Flats and Portlock Bank because of the presence of tanner and king crab, shrimp, and marine mammals.[64] They asked for the exclusion of these areas from the lease sale; areas that comprised about 25 percent of the original lands called for by the Bureau of Land Management.[65] BLM's tentative selections, however, included tracts from within these three areas.[66]

State officials are particularly concerned about potential environmental impacts and marine use conflicts resulting from a lease sale in the western Gulf of Alaska. OCS development in this region will endanger "the most intensive and valuable shellfish fisheries in Alaskan waters" as well as major populations of herring, salmon, seabirds and marine mammals. State officials are worried about the extreme seismic risk

Figure 7. Tracts tentatively selected for leasing in the western Gulf of Alaska (Source: Oil and Gas Journal, May 10, 1976).



within the proposed leasing area and believe that onshore socio-economic impacts may be as severe as those predicted for the northern Gulf.[67]

An extensive coring program in the western Gulf of Alaska is currently underway by several oil companies to improve geological data prior to the lease sale. Five oil companies have contracted Exploration Services Company to drill up to ten 4,000 ft. holes in the proposed leasing area.[68] In addition, Atlantic Richfield Company plans to drill a 7,500 ft. stratigraphic test well on the Kodiak shelf about 50 miles east of the city of Kodiak.[69]

Environmental and Socioeconomic Impacts

No major OCS impact studies are presently available for the western Gulf of Alaska. Several studies, however, are in progress and will be completed in the near future. These include: (1) a draft and final environmental impact statement by the BLM, (2) a socio economic impact study under contract for several oil companies by Mathematical Sciences Northwest, and (3) onshore planning and coastal impact-studies conducted by Alaska's Department of Community and Regional Affairs.

Some work, already completed, by O'Conner and Dobey predicts the rate and amount of offshore and onshore OCS development for two different production scenarios resulting from the proposed Kodiak lease sale.[70] Their findings are grouped into two distinct categories, one for a low production scenario (372 million barrels of oil and 2.3 billion cubic feet of gas) and one for a high production scenario (2.5 billion barrels of oil and 8 trillion cubic feet of gas). They estimate a high production scenario would result in:

(1) An average of 60 exploratory wells drilled from 1977-1982.

(2) Seven fields discovered with initial commercial production beginning in 1982 and peak production occurring in 1991 at a rate of 560,000 barrels/day.

(3) Acquisition or construction of offices, housing, and docks beginning in 1977.

(4) Construction of tanker, loading, oil storage, and camp facilities beginning in 1979.

(5) Construction of production platforms beginning in 1980; San Francisco Bay shipyards may be the site of construction.[71]

Another report, written by Bob Waldrop, examines in very general terms, potential impacts arising from OCS development in the western Gulf of Alaska.[72] Waldrop assumes that from 3.6-9.2 billion barrels of oil will be recovered from the western Gulf. This estimate seems high given USGS estimates for the entire State of Alaska. Nevertheless, under this production assumption the report predicted that:

(1) From 7 to 10 exploratory rigs will be used directly employing 1,050 to 1,500 people.

(2) The western Gulf will need 1.3 times the onshore facilities required for the northern Gulf of Alaska.

(3) Petroleum facilities will require 2,000 to 3,200 acres of land.

(4) Approximately 300 miles of pipeline will be constructed.

(5) Onshore staging areas will probably be located at existing ports and airstrips.

(6) Petroleum will directly employ about 4,200 workers during the height of the development phase. This will drop to 2,500 workers during the production phase.

(7) Total oil spilled in the Kodiak area may reach 250,000 to 640,000 barrels with 3.6 billion barrels recovered, or up to 10.8 to 24.6 million barrels with 9.2 billion barrels recovered.[73]

Potential onshore sites supporting offshore development in the western Gulf have been identified by Alaska's Department of Community and Regional Affairs (Table 4 and Fig. 4). Fourteen sites in three areas, Resurrection Bay, Kenai Peninsula, and Kodiak Island are the prime candidates for onshore facilities in the area.[74] One of these sites, Cape Chiniak, has received considerable attention as a likely staging area (particularly for exploratory activities). Located 40 miles from the city of Kodiak, Chiniak is owned by the Koniag native corporation.[75] Unlike most native corporations in the northern Gulf, Koniag favors prompt leasing of OCS lands.[76] Further, Koniag is hoping to work out a deal with the oil industry, trading them rights to use Chiniak and other sites for a share of royalties of all oil handled by any Kodiak Island port or refinery.[77]

5.2.5 Beaufort Sea

Description of the Region[78]

The Beaufort Sea, part of the Arctic Ocean, has a very narrow continental shelf which extends 30 to 60 miles off the northern coast of Alaska. The onshore region is characterized by flat lowlands, numerous

marshes, and thaw lakes. Barrier islands are the distinctive feature of this region. Estuarine waters exist between the islands and the coast.

Ocean currents in the Beaufort Sea flow westward between Mackenzie Bay and Point Barrow. Along this section of coast, the slow westerly drift formed by the clockwise Beaufort Gyral flows directly against the continental land mass. Local winds, however, may reverse the westward drift and send the current easterly in nearshore reaches. Storms are frequent, particularly during summer, and occasionally generate storm surges that strongly impact the Arctic coast.

Ice cover in the Beaufort Sea is essentially complete in winter except for leads. Large chunks of floating sea ice, occasional pieces of broken ice islands, and deep keels of pressure ridges often become grounded in the shelf sediments which form deep gouges in the sea floor. Freezeup and breakup dates are variable and unpredictable. At Point Barrow, freezeup may occur anytime between early September and late November. Breakup has occurred as early as mid-June and as late as late August. Air temperature may be as high as 20C in the summer and as low as minus 55C during winter.

Biologically, the shallow coastal environment along and within the barrier island chain is more productive than the open sea. About 71 species of fish live in the estuaries and marine areas of the Beaufort Sea. Arctic cisco, least cisco, broad and humpbacked whitefish, char, fourhorned sculpins and arctic flounders are abundant in inshore areas. A small commercial fishery for cisco and whitefish occurs in the Colville River delta.

The nearshore waters are critical to most waterfowl in the Arctic. This habitat is the first marine water open in spring and is used by waterfowl for feeding and resting throughout the short summer. The protected lagoons behind the barrier islands are particularly important since two-thirds of the bird populations of the Canadian Arctic islands pass this way. Almost all of the 163 species of birds in the area are present only from May to September.

Approximately 22 terrestrial and 17 marine mammal species occur in the region, including most conspicuously, polar bears, barren ground carribou, ringed, bearded and harbor seals and six species of whales. Significant numbers of mammals are present year-round.

The population centers of Alaska's Arctic slope are largely along the coast at sites historically occupied for subsistence livelihood. Villages are predominantly Eskimo. Barrow is the seat of the North Slope Borough and a distribution center for the region. The exceptions are the new petroleum development camp settlements at Prudhoe Bay and Deadhorse. Steady employment has increased in the Arctic slope since World War II, and some natives are able to work in state and federal agencies and in pipeline related activities to supplement their traditional lifestyle.

Petroleum Resources

Geologists believe the chances of finding large amounts of petroleum under the Beaufort Sea are very good. Best prospects are thought to be located on the 20,000 square miles of territory adjacent to the coast and large onshore accumulations of oil (e.g., Prudhoe Bay).[79]

The USGS has not released figures concerning undiscovered recoverable petroleum resources on Beaufort's OCS. However, Alaska has estimated that state-held offshore resources in the Beaufort Sea area will yield 2.7 billion barrels of oil and 13.5 billion cubic feet of gas.[80] If these figures are accurate, recoverable oil and gas resources from Beaufort's OCS are probably even larger.

Status of OCS Operations

BLM has scheduled two Beaufort Sea lease sales, a joint Federal-state sale in February 1978 and a second federal sale in February 1979. To date the Bureau has not indicated what areas it will call for tract nominations from industry.

Early in 1975, Alaska had planned to hold a state lease sale in the Beaufort Sea. State officials had proposed the sale to raise money to cover projected budget deficits during the fiscal years of 1976 and 1977. But the sale was suddenly and indefinitely delayed by Governor Hammond in July 1975 when the state's fiscal position brightened with passage in the legislature of a reserve's tax on oil and gas.[81]

Alaska's interest in leasing state lands in the Beaufort Sea resulted in an increase in geophysical activity and exploratory drilling in the region. A half dozen surveys were run during the summer of 1975 making the nearshore regions of the Beaufort Sea one of the more thoroughly explored frontier regions off Alaska. Development wells north of Prudhoe Bay and an exploratory well on Flaxman Island have further improved geological information.[82]

Several jurisdictional problems exist in the Beaufort Sea that may hinder leasing. One is the international boundary between the U.S. and Canada in the eastern Beaufort Sea which will involve negotiations between the two countries to clarify ownership.[83] The second involves a dispute between Alaska and the Federal government over the ownership of a narrow strip of offshore lands, between the barrier islands and the coast.[84] This dispute will probably be taken to court soon, once either side actually holds a lease sale.

Environmental and Socioeconomic Impacts

Information concerning potential OCS impacts from the development of Beaufort Sea petroleum resources is sparse. Much of what is available was written in response to the state's leasing proposal.

Ice is the most serious hazard facing petroleum operations in the Beaufort Sea. Its frequent, forceful, and unpredictable movement demands drilling technology only partially available. Present technology can only exploit petroleum resources in shallow waters of up to 60 feet.[85] Technology capable of exploring and developing oil and gas resources in 60-200 feet of water has been estimated to be about 5-10 years away.[86]

Four shallow water drilling methods are among those currently available: (1) slant drilling from onshore sites (good for up to 1 mile offshore), (2) drilling from artifical gravel islands, (3) drilling from artificial ice islands, and (4) drilling from sunken flat barges. In the latter three cases standard land rigs are used on artificial pads. Of these drilling technologies, gravel islands are the most likely to be used on Beaufort's OCS.[87]

Permafrost is another hazard facing industry in the Beaufort Sea. Because of significant ice scouring caused by ice flows, pipelines will have to be buried deep into subsea permafrost. Not much is known about how this environment will react to development or what the impact of pipeline burial will be.[88]

Besides ice hazards and subsea permafrost, two other features of Beaufort's nearshore environment may constrain or pose risks to oil development activities and facilities. These are: (1) a limited supply of freshwater and (2) a scarcity of gravel. Environmental damage caused by extracting gravel and/or hauling it long distances could be substantial.[89]

The risk of a well blowout is a particularly serious problem in the Beaufort Sea. If one occurred it could continue uncontrolled for more than a year before a relief well could be drilled to bring it under control due to the severe weather conditions of the Beaufort Sea.[90] Under these circumstances, considerable amounts of oil would be spilled and eventually pollute the leads or strips of open water that form within the offshore ice at spring breakup. Oil pollution in these leads would probably trap thousands of mammals--whales, seals, polar bears, and Arctic foxes, and countless waterfowl.[91] Oil-spill countermeasures available in 1976 would not greatly decrease the impact of such a spill on wildlife[92] and biodegradation of the oil would be slow in the Arctic environment. A study prepared by the Canadian Department of Environment estimated the probability of a well blowout in Arctic waters at from 1 in 1,000 to 1 in 10,000.[93]

Three other kinds of impacts to Beaufort's environment would accompany oil development activities. Losses would occur from (1) chronic

and cumulative pollution from oil spills and sewage, (2) changes in currents, inshore ice action, salinity and the sedimentation of nearshore areas from development (particularly gravel islands and causeways), and (3) disturbances of wildlife from acute or persistent human activity.[94]

The most likely sources of risk to bird populations include disturbance or elimination of island-nesting terns, gulls, and eiders, and direct mortality to waterfowl and seabirds from oil spills. Mammals most likely to be affected are polar bears, which den in the area, and ringed seals. Fish populations risk mortality from seismic detonations and oil spills, and may suffer habitat losses from gravel removal and siltation. Plankton and invertebrates, basic food sources in the marine ecosystem, could suffer temporary or long-term losses from large oil spills, cumulative buildup of oil and other toxic compounds in muds or waters, and changes in nearshore currents and salinity.[95]

OCS development in the Beaufort Sea would continue the present trend of substituting a modern cash economy for the more traditional lifestyle of many north slope residents. Major community infrastructure and economic impacts may arise from the creation of a permanent, residential community in the Prudhoe Bay area.[96]

Alaska has argued that several factors favor leasing in the Beaufort Sea over leasing in the Gulf of Alaska or Cook Inlet. Governor Hammond listed these factors as:

(1) An existing transportation system--the trans-Alaska pipeline--which could speedily move oil and gas resources to market.

(2) The avoidance of massive community and regional impacts both economic and social.

(3) Existing onshore support facilities at Prudhoe Bay.

(4) Smaller environmental risks both offshore and onshore.

(5) The absence of major commercial fisheries in the Beaufort Sea.[97]

These arguments, of course, reflect Alaska's desire to justify offshore leasing on state-owned lands in the Beaufort Sea.

5.2.6 Chukchi Sea (Hope Basin)

Description of the Region[98]

The Chukchi Sea is a shallow body of water lying between the Arctic Ocean and Bering Strait averaging about 145 to 180 ft. in depth. The onshore region is low and marshy with numerous lakes and small streams and is underlain by permafrost.

Ocean currents in the Bering Strait flow predominately northward from the Bering Sea into the Chukchi Sea and Arctic Ocean. Sea ice coverage in the Chukchi varies greatly from year to year and is not a solid mass; polynyas and leads are present in both the polar and winter pack, and in summer open water areas become extensive along the entire coast, especially in the southern part of the region. The presence or absence of ice affects fish, bird, and mammal movement and behavior in this area.

Fishery resources of the area are primarily benthic or demersal. Arctic cod, Bering flounder, and sculpins are the predominant species. Salmon runs in the Chukchi support a commercial fishery centered in the Kotzebue area with major escapements to the Kobuk and Noatak river systems.

Coastal lagoons of the Chukchi Sea are important feeding and resting areas for migrating birds. Marshes on the Seward Peninsula and adjacent to Kotzebue Sound are nesting grounds for numerous water birds and shorebirds.

The Chukchi Sea provides habitat for marine mammals that tend to follow the edge of the pack ice in its seasonal advance and retreat. Polar bears, walrus, and seals, mainly bearded, ringed, and harbor seals, are abundant along the edge of the ice pack and the coast.

Most residents of the Chukchi Sea are Eskimos, although Kotzebue and Barrow, the largest population centers, have substantial non-native populations. Nearly all residents of the Chukchi Sea coast depend heavily on marine resources, particularly walrus, seal, and whale, although considerable commerce and industry occur at both Kotzebue and Barrow. Subsistence fisheries are most important in the area south of Cape Lisburne. Residents of the small villages earn some cash income from jobs elsewhere in Alaska, at Air Force stations along the coast, and from some commercial activities at Kotzebue.

Petroleum Resources

USGS estimates of recoverable oil and gas resources for the Chukchi Sea have not been released.

Status of OCS Operations

The western boundary of the Chukchi Sea has not yet been defined. The United States and Russia will have to negotiate an acceptible international boundary.

The Bureau of Land Management plans to lease offshore acreage in Kotzebue Sound in December of 1979, making the Chukchi Sea the fifth frontier area leased off Alaska.

Environmental and Socioeconomic Impacts

Waldrop's 1975 study of OCS impacts in the Chukchi Sea is the only information currently available.[99] His findings are:

1. There will be 2.1 to 5.4 billion barrels of oil recovered from the Chukchi Sea.
2. Seven to ten exploratory rigs may be expected with direct employment totalling 1,050 to 1,500.
3. Requirements for onshore facilities will be about one-third less than for the northern Gulf of Alaska leasing area.
4. Two hundred miles of pipeline will be constructed.
5. Nome and Kotzebue will be the major transportation centers.
6. Direct employment will peak during the development phase at 2,400 workers. This will drop to 1,440 workers during the production phase.
7. A new trans-Alaska pipeline may have to be built to transport the oil to market.
8. Total oil spills will range from 141,000 to 16,200,000 barrels over the life of the field.
9. Noise, physical disturbance, and other activities associated with OCS development may have negative impacts on traditional native subsistence culture in the area.

10. Birdlife most likely to be impacted by OCS development are the: American widgeon, pintail, scaup, oldsquaw, scoters, whistling swan, cackling Canada goose, black brant, white-fronted goose, emperor goose, yellow-billed loon, sandhill crane, and the gyrfalcon. Many bird species have adapted to be strictly dependent on estuarine habitat; no alternative habitat will suffice.[100]

5.2.7 Bering Sea (St. George Basin)

Description of the Region[101]

The Bering Sea is a large, relatively confined area of 550,000 square miles. The continental shelf, accounting for 44 percent of the total Bering Sea area, is one of the largest in the world and extends more than 375 miles offshore in the northeast sector. It is a flat gently sloping plain with an average depth of less than 325 feet.

The St. George region of the Bering Sea is situated within a portion of the northeastern Pacific Ocean dominated by subarctic Pacific waters. The major ocean circulation pattern of the Bering Sea is cyclonic, flowing eastward along the north side of the Aleutians, northward in the eastern portions of the Bering Sea and southward along the Siberian coast. Locally, the surface currents are influenced by prevailing winds and, therefore, vary greatly depending upon the weather.

Generally, the maximum southern limit of sea ice in the Bering Sea is from Bristol Bay to the vicinity of St. George Island in the Pribilofs. North of this boundary the Bering Sea has a 50 percent ice cover for 5 months of the year. Ice formation begins in this area in early

winter and is at its maximum in February and March. Sea conditions are rough in the ice-free season when waves are generated by severe local storms.

Fisheries in the Bering Sea are very productive. Large stocks of Pacific herring, walleye pollock, Pacific cod, Pacific ocean perch, sablefish, and several species of flatfish support lucrative commercial fisheries. All five species of Pacific salmon migrate through this area. Shrimp abound in isolated areas near the Pribilof Islands, and Japanese fishing vessels trap several species of edible marine snails in the area.

Offshore, marine mammals are not as abundant as in the coastal areas. The Pribilof Islands, though, have large populations of fur seals, sea otters and sea lions.

Major seabird colonies in the Pribilof Islands are inhabited by crested auklets, common and thick-billed murres, red-legged and black-legged kittiwakes, red-faced and pelagic commorants, and tufted and horned puffins. In addition, offshore waters are populated by slender-billed shearwaters, northern fulmars and forked-tailed petrels.

Communities bordering the St. George basin are small, predominantly Aleut coastal villages. They include St. George and St. Paul on the Pribilof Islands, and the villages of Nikolski, Unalaska, Akuton, False Pass, and Nelson Lagoon on the Alaskan Peninsula. Sealing, fishing and berry-picking form the traditional subsistence base of the Pribilof Islands. Hunting and trapping are also important on the Peninsula. The traditional subsistence economy has been modified over the last 100 years and a cash economy now dominates. This is particularly true in the Pribilofs where natives harvest and process seals for subsistence as

well as for the world market. Employment throughout the region is seasonal in character, there are few permanent jobs, little regular transportation between villages, and there are no deepwater ports.

Petroleum Resources

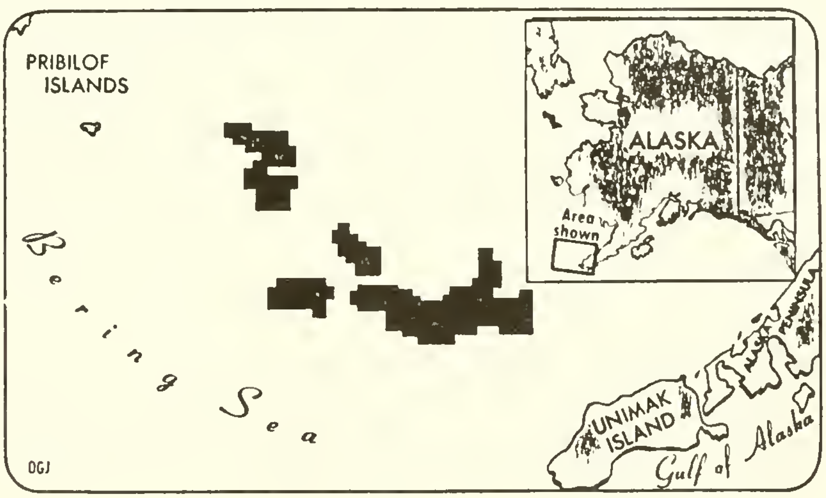
Little is currently known about the petroleum geology of this region, but some experts in industry believe that the Bering Sea is an area of great promise.[102] USGS estimates regarding petroleum resources in this area are not presently available.

Status of OCS Operations

St. George Basin in the Bering Sea is scheduled by the Department of the Interior to be leased in May of 1980. BLM has tentatively chosen 299 tracts totalling some 1.6 million acres for leasing. The selected tracts are between 35 and 125 miles offshore in sub-Arctic waters 345-460 ft. deep. The tracts generally lie on a northwest-southeast line between the Pribilof Islands and the eastern end of the Aleutian Island chain (Fig. 8).[103]

The present list of tracts to be leased is a sharp cutback from the original 3,600 tracts and 20.6 million acres submitted to Industry for nominations by BLM and the 16.5 million acres nominated for inclusion in the sale by Industry.[104] BLM sharply limited the acreage because of the major commercial fisheries that exist in the area. The Bureau noted also that the area has many migratory routes and breeding grounds for fishes, mammals, and birds and is regarded by scientists as among the most productive waters in the world.[105]

Figure 8. Bering Sea proposed lease area (Source: Oil and Gas Journal, 22 March 1976).



Last July, Atlantic Richfield Company, started a 15,000 ft. strategraphic test well for a 20-company group on BLM tract 459. This test will give the oil industry valuable subsurface geological data in advance of the proposed lease sale. A semisubmersible rig, the Ocean Ranger, is drilling the $16.5 million hole in 440 feet of water midway between the Pribilof Islands and Dutch Harbor. The test, located off-structure to avoid encountering oil and gas, is the first to be drilled in the Bering Sea. Three 200 ft. supply boats are operating out of Captain's Bay on Unalaska Island to service the rig. Personnel and light supplies are being transported by helicopter from Dutch Harbor, 117 miles to the southeast.[106]

Environmental and Socioeconomic Impacts

Little information exists concerning potential impacts from developing the St. George Basin in the Bering Sea. All that exists are Waldrop's 1975 general impact predictions.[107] These are:

(1) There will be 2.0 to 5.2 billion barrels of oil recovered from St. George Basin.

(2) From three to five exploratory rigs will be used directly employing 500 to 750 people.

(3) One to three support/supply installations and one LNG plant will be constructed onshore during the development phase.

(4) 750 to 1,200 acres of land will be needed to locate energy-related facilities.

(5) Direct employment will peak during the development phase at 2,300 workers. This will drop to 1,400 workers during the production phase of operation.

(6) Onshore staging areas will probably be located near existing airstrips and docks.

(7) Total oil spills will range from 140,000 to 15,600,000 barrels over the life of the field.[108]

5.2.8 Bering Sea (Norton Basin)

Description of the Region[109]

The northern Bering Sea is bounded on the south by Nunivak and St. Matthew Islands, on the west by Siberia's Gulf of Anadyr, and on the north and east by Bering Strait and Norton Sound respectively. Shorelines along Norton Sound and the Seward Peninsula are generally abrupt with steep bluffs interspersed with small stretches of low-lying sandy or silty beaches. The entire region is underlain by discontinuous permafrost, which becomes continuous north of the mountainous backbone of the Seward Peninsula.

The northern Bering Sea is entirely continental shelf and is generally shallow and of low relief. Norton Sound is a subarctic embayment averaging 65 feet deep. Surface currents reflect the general northward drift of water toward Bering Strait. Sea ice is a common condition covering the entire area from late autumn through early spring.

The presence or absence of ice profoundly affects fish, bird and marine mammal movement and behavior in this area. Many of these species congregate near the edge of the pack ice and move in response to ice motion. Plankton, invertebrates, and fishes that thrive at the ice edge in great abundance provide food for the concentrations of marine birds and mammals.

Predominant demersal fish in Norton Sound are members of the flat fish family. All five species of Pacific salmon inhabit this area. Large pink salmon runs occur in the Staktoolik, Uralokleet, Ungalik, Inglutalik, and Niukluk Rivers.

Coastal marshlands along the south coast of the Seward Peninsula, especially near Solomon, Golovin, Koyuk, and Shaktoolik, are important stopovers for migrating swans, snow geese, Canada geese, sandhill cranes, and shorebirds. In offshore areas, murres, guillemots, puffins, auklets, jaegers, fulmars, and others feed in and beneath the ice edge.

Over 20 coastal villages are inhabited by Eskimos where traditional subsistence ways predominate. These people depend on the marine resources of the Bering Sea for most of their livelihood. Sealing, walrus hunting and fishing are the subsistence base of the area. Nome (pop. 2,500) on Norton Sound is the major town and has a large non-native population, but few permanent jobs exist in Nome or in the smaller villages. Fisheries-related seasonal employment is high, but few families earn enough in the short period to survive on a cash economy basis.

Petroleum Resources

Little seismic work has been done for Norton Basin in the northern Bering Sea. Nevertheless, oil companies are optimistic about the petroleum potential of the region based upon available geophysical data.

At the present time it is sheer speculation as to how much oil is present on Norton Basin. USGS estimates of recoverable petroleum resources probably won't be available for a while.

Status of OCS Operations

BLM had originally scheduled the Norton Basin for leasing in August of 1978 but Interior's October 1976 proposed leasing schedule indefinitely postponed any sales in this area.

Environmental and Socioeconomic Impacts

Information concerning OCS impacts resulting from development of Norton Basin in the Bering Sea is limited to Waldrop's 1975 general impact predictions.[100] These are:

1. Recoverable oil should range from 4.6 to 12.0 billion barrels for the Norton Basin.
2. Ten to fifteen exploratory rigs may be expected with direct employment totalling 1,500 to 2,250.
3. Roughly 1.5 times the onshore facilities will be needed for Norton Basin as is required for the northern Gulf of Alaska. Frozen seas from October to May may require substantially more onshore storage, a long pipeline to an ice-free ocean, or another trans-Alaska pipeline.
4. About 450 miles of pipeline may be needed to connect wells and storage loading facilities for Norton Sound production.
5. Direct employment will peak during the development phase at 5,400 workers. This will drop to 3,200 workers during the production phase. This does not include secondary employment.
6. If tankers are used, tanker traffic may reach two to three per day. Service vessels will number from 30 to 90 for Norton Basin.
7. Total oil spills will range from 574,000 to 64,200,000 barrels over the life of the field.

8. Sea mammals, fish, and migratory birds, all of which constitute a significant subsistence resource, will be vulnerable to depletion via oil contamination, excessive human activity, or onshore facilities.[111]

5.2.9 Southern Aleutian Shelf

Information regarding the southern Aleutian Shelf is quite scarce (except for individual fishery and oceanography studies). A lease sale originally scheduled for October 1978 has now been indefinitely postponed by the BLM.

The southern Aleutian shelf is characterized by intense storms, high precipitation, moderate temperatures and a fjord coastline. The Aleutian Islands are sparsely populated by Aleuts and Eskimos who rely on subsistence hunting and fishing. Cold Bay is the major town and transportation hub for the Aleutian chain.

5.2.10 Bristol Bay

Description of the Region[112]

Bristol Bay is a large, comparatively shallow bay surrounded by a combination of lowlands and various mountain systems. The coastline is characterized by sandy beaches but includes a few cliffs, hills and ridges along the shore between Cape Newenham and Kulukak Bay.

Ice is a problem in this area, particularly close to shore. Ice formation begins in mid-October and often persists into late spring.

The frequency of storms and gales is comparable to that in the Gulf of Alaska. However, due to a limited fetch, Bristol Bay waves do not generally attain the height of those in the Gulf of Alaska.

Bristol Bay has the world's largest sockeye salmon fishery. The other four species of Pacific salmon are also abundant and tanner crab and king crab are commercially important.

The coastal lagoons support one of the densest populations of waterbirds in the world. Nesting seabirds such as kittiwakes, guillemots, murres, gulls, auklets, and puffins comprise the largest seabird rookeries.

Marine mammals of the Bristol Bay coast are diverse and numerous. The Steller sea lion occurs all along the rocky coast of outer Bristol Bay, while the harbor seal prefers the gentler slopes and sandy beaches. The formerly endangered sea otter is common along southern Bristol Bay, especially close to shore near kelp beds.

Some twenty villages and small towns are situated along the shores of Bristol Bay. Half of the region's population lives in the Bristol Bay Borough (Naknek, King Salmon, and South Nakned) and in Dillingham. The population is two-thirds native of which some 60 percent is Eskimo. The majority of the non-native population is located around the Air Force Base at King Salmon. Outside the main population centers, which are important hubs of transportation and communication, the economy is based on fishing, hunting, and trapping.

Petroleum Resources

In Interior's 1974 industry-wide survey of frontier leasing areas, Bristol Bay ranked fourth in potential production behind the Gulf of Alaska, central Gulf of Mexico and Beaufort Sea.[113] The oil industry, however, had little more than coarse grid seismic information upon which

to base this optimistic forecast. To date USGS estimates have not been released regarding undiscovered recoverable petroleum resources for Bristol Bay.

Status of OCS Operations

Industry has been conducting exploratory activities in Bristol Bay to improve its geophysical data. During the summer of 1975, 33 companies headed by Skelly Oil Co. conducted a "group shoot" of the region to provide detailed information of previously mapped areas and regional mapping where little or no previous seismic work had been done.[114] In addition ARCO has plans to drill a stratigraphic test well in Bristol Bay.[115]

BLM had originally scheduled a lease sale for Bristol Bay in December of 1977 but has since indefinitely postponed this sale.

Environmental and Socioeconomic Impacts

Information regarding OCS impacts from a Bristol Bay sale is limited to Waldrop's general impact predictions.[116] These are:

1. There will be 4.0 to 10.2 billion barrels of oil recovered from Bristol Bay.
2. Seven to ten exploratory rigs will be used directly employing 500 to 700 people.
3. Three to five support/supply installations and one LNG plant will be constructed onshore during the development phase.
4. 1,500 to 2,400 acres of land will be needed to site energy-related facilities.
5. Four hundred and fifty miles of pipeline will be constructed.

6. Direct employment will peak during the development phase at 4 600 workers. This will drop to 1,400 workers during the production phase of operations.
7. Onshore staging areas will probably be located near existing airstrips and docks.
8. The shallow waters of Bristol Bay may force storage and loading operations to be done entirely offshore. The alternatives to this is massive dredging.
9. Total oil spills will range from 280,000 to 30,000,000 barrels over the life of the field.[117]

5.2.11 Footnotes

[1]U.S. Geological Survey. No date. Geological Estimates of Undiscovered Recoverable Oil and Gas Resources in the United States. USGS Circular 725. U.S. Government Printing Office, Washington, D.C. pp. 26-32.

There is disagreement between USGS and State of Alaska estimates concerning the magnitude of oil underlying the Alaskan OCS. State experts estimate that Alaskan OCS oil reserves total about 50 billion barrels of recoverable oil (from untitled manuscript, John Williams, pp. 2).

[2]Coastal Zone Management. November 3, 1976. Vol. 7, No. 44. Nautilas Press Inc., Washington, D.C. pp. 2.

[3]Edmondson, C. A. October 1975. Offshore Oil: Activity Stepping Up Though Conflicts Remain. Alaska Industry, Anchorage, AK. pp. 48-49.

[4]No author. September 1975. The State in the Far North Has Produced Oil Since 1895. Offshore. Vol. 35, No. 10. pp. 96-97.

One of these lease sales, the 1973 Kachemak Bay sale (near the mouth of Cook Inlet) sparked a bitter conflict between fishing and oil interests that may portend similar difficulties with future OCS development, Fishing and conservation groups fought to void a $25 million lease sale in Kachemak Bay, an area widely acknowledged to be one of the most biologically productive bodies of water in the world. Opponents argued that the state, under the Egan administration, ignored scientific evidence about the bay's ecological importance while also preventing citizen input prior to the lease sale. This conflict reached a fever pitch in the summer of 1976 after the destruction of some local fishing gear by oil exploration activities and after a small but dramatic 30,000-gallon spill from a drilling rig mired in the Bay. The spill created a slick more than 2 miles long which proved to be very difficult to clean up. Faced with a dangerous political and environmental situation, the Alaska state legislature enacted a law authorizing the governor to buy back the Kachemak Bay acreage either through negotiation with oil officials or by condemnation after a period of one year.

[5]U.S. Department of Interior, Bureau of Land Management. July 1976. Draft Environmental Impact Statement, Lower Cook Inlet. Bureau of Land Management, Washington, D.C. pp. 23-28.

[6]Op. cit. The State in the Far North Has Produced Oil Since 1895. pp. 97.

[7]U.S. House of Representatives Hearings. August 5-7, 1975. Outer Continental Shelf Lands Act Amendments of 1975. Part 2, H.R.6218. U.S. House of Representatives, Washington, D.C.

[8]Anchorage Times. February 4, 1975. Drilling Called Invasion: Shelf Proposals Stirs Fuel vs. Food Debate. Anchorage Times, Anchorage, Alaska. pp. 1-2.

[9]A number of sources are useful for identifying general OCS impacts in Alaska. These are: Final Environmental Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Dept. of Interior, Vol. I-II. Volume III is particularly useful as it contains the coastal states and federal agency responses to BLM's draft statement (subsequently referred to as Programmatic EIS).

Council on Environmental Quality. April 1974. OCS Oil and Gas--An Environmental Assessment, Volume 1. Council on Environmental Quality, Washington, D.C.

Op. cit. Williams. pp. 18-27.

[10]Mallott, B. October 31, 1975. Report on the Probable Impacts on Native People Both Beneficial and Adverse Resulting from Offshore (OCS) Federal Oil and Gas Leases Using Yakutat as a Case Study. U.S. Department of Interior, Bureau of Indian Affairs, Juneau, Alaska.

[11]Southeast Alaska Empire. August 19, 1975. Coastal Alaska, Scotland Share Similar Oil Impact. Southeast Alaska Empire. pp. 1.

[12]Baldwin, P. L. and M. F. Baldwin. 1975. Onshore Planning and Offshore Oil--Lessons from Scotland. The Conservation Foundation, Washington, D.C.

[13]Information for this subsection is taken from two sources: Physical, Biological and Human Environments of the Alaskan Outer Continental Shelf Lease Areas. Arctic Environmental Information and Data Center, March 1976 (Subsequently referred to as the AEIDC Report) and Final Environmental Impact Statement, Northern Gulf of Alaska. Bureau of Land Management, January 1976, Vol. I (Subsequently referred to as Northern Gulf Final EIS).

[14]Carmichael, J. September 1975. Four Offshore Areas Dominate Geology for State of Alaska. Offshore. Vol. 35, No. 10. pp. 102.

[15]Thake, S. September 1975. Drilling Rigs Will Have a Tough Go Off Alaska Due to Weather. Offshore. Vol. 35, No. 10. pp. 102.

[16]No author. April 1976. Gulf of Alaska Again Eyed by Wildcatters. Offshore. Vol. 36, No. 4. pp. 52.

[17]Wilson, H. M. December 2, 1974. Pending Burst of Leasing Spells Big Alaskan Search. Oil and Gas Journal. Vol. 72, No. 48. pp. 26.

[18]Op. cit. Northern Gulf Final EIS. pp. 6-7.

[19]Ibid. pp. 25.

[20]Ibid.

[21]Hammond, J. Governor. December 4, 1975. Letter to Thomas S. Kleppe. Office of the Governor, Juneau. pp. 2.

[22]Anchorage Times. January 19, 1976. Agencies Resist Leasing in Gulf. Anchorage Times, Anchorage, Alaska.

[23]Seattle Times. February 19, 1976. Alaska Oil-Lease Sale Gets Approval. Seattle Times, Seattle, Washington. pp. 1.

[24]Rintoul, B. May 1976. The Gulf of Alaska Lures Explorers with Prime Structures. Offshore. Vol. 36, No. 5. pp. 246.

[25]Wilson, H. M. April 19, 1976. Shell, ARCO Top Bidders at Gulf of Alaska Sale. Oil and Gas Journal. Vol. 74, No. 16. pp. 21.

The Bureau of Land Management rejected the high bonus offers on five of the 81 tracts which industry sought to buy in the Gulf because the bids were far below the evaluations of government geologists (Blocks 410, 409, 151, 116, 318). BLM Rejects Five Bonus Bids in Gulf of Alaska Lease Sale. Oil and Cas Journal. May 3, 1976. pp. 128.

[26]Ibid. pp. 21.

[27]No author. June 28, 1976. Alaska Gulf Leases Due First Test This Fall. Oil and Gas Journal. Vol. 74, No. 24. pp. 62.

[28]Wilson, H. M. March 15, 1976. Industry Near Long-Sought Crack at Gulf of Alaska. Oil and Gas Journal. Vol. 74, No. 11. pp. 55.

[29]Todd, F. March 1976. Semi-submersible Drilling Rigs to Brave Gulf. Alaska Industry. Anchorage, Alaska. pp. 37, 40, 42, 53-54.

The Sedco 706 is designed to withstand 102 foot waves at 17 second intervals and 114 knot winds.

[30]Op. cit. Industry Near Long-Sought Crack at Gulf of Alaska. pp. 51-58.

[31]Op. cit. Alaska Gulf Leases Due First Test This Fall. pp. 62.

[32]Material for this subsection is taken from the following sources: An Economic and Social Impact Study of Oil Related Activities in the Gulf of Alaska, Mathematical Science Northwest, May 5, 1975; Report on Potential Impacts to National Parks, Refuges and Forests by OCS Oil and Gas Development in Alaska, Bob Waldrop, June 4, 1975; Report on the Probable Impacts on Native People Both Beneficial and Adverse Resulting from Offshore (OCS) Federal Oil and Gas Leases, Using Yakutat as a Case Study. Byron L. Mallott, October 31, 1975; op. cit., Northern Gulf Final EIS, Vols. I-II; op. cit., CEQ Report, Vols. I and IV.

[33]Op. cit. Northern Gulf Final EIS. Volume I. pp. 12.

[34]Op. cit. Mathematical Sciences Report. pp. II-3.

[35]Op. cit. CEQ Report. Volume IV. pp. 7-6.

[36]Op. cit. Northern Gulf Final EIS. Volume I. pp. 15-18.

[37]Alaska Department of Community and Regional Affairs. June 10, 1976. Methodology for Facility Siting. State of Alaska Department of Community and Regional Affairs, Juneau, Alaska.

[38]Ibid.

[39]Op. cit. Waldrop. pp. 5-20.

[40]State of Alaska. January 1976. Comments on the Proposed Oil and Gas Leasing in the Northern Gulf of Alaska. Northern Gulf Final EIS. U.S. Department of Interior, Bureau of Land Management, Washington, D.C. pp. 125-353.

[41]Fairbanks Daily News-Miner. September 16, 1975. State Computes OCS Costs at Near $300 per Alaskan. Fairbanks Daily News-Miner, Fairbanks, Alaska. pp. 1.

For details on how the study was done see Economic Assessment of the Northern Gulf of Alaska Draft Environmental Impact Statement for Sale, No. 39. State of Alaska, Department of Revenue. 1975.

[42]op. cit. Northern Gulf EIS. Volume 2. pp. 515.

[43]Ibid. pp. 515-516, 522, 528.

[44]Ibid. pp. 517-520.

[45]Seattle Times. June 20, 1976. History Puts Shock of Oil Boom into Focus. Seattle Times, Seattle, Washington. pp. D-3.

[46]Southeast Alaska Empire. August 21, 1975. Juneau: Offshore Oil Support Site? Southeast Alaska Empire, Juneau, Alaska. pp. 1.

Paul, T. March 1976. Offshore Oil: The State-Federal Tug of War. Alaska Industry, Anchorage, Alaska. pp. 36.

[47]Two sources were used for this subsection, Draft Environmental Impact Statement, Lower Cook Inlet. Bureau of Land Management, July 1976 (subsequently referred to as Lower Cook Inlet Draft EIS), and op. cit., AEIDC Report.

[48]Rintosil, B. September 1975. Gulf of Alaska May Offer Best Prospects for Oil and Gas. Offshore. Vol. 35, No. 10. pp. 90.

[49]Magoon, L. B., et. al. June 7, 1976. USGS Rates Oil Potential of S. Cook Inlet. Oil and Gas Journal. Vol. 74, No. 23. pp. 172.

[50]No author. March 8, 1976. Interior Picks 152 Tracts for Fall Lower Cook Inlet Lease Sale. Oil and Gas Journal. Vol. 74, No. 10. pp. 29.

[51]Op. cit. Lower Cook Inlet Draft EIS. pp. 4-5.

[52]Op. cit. BLM Seeks Input on Tracts that May be Sold in Lower Cook Inlet. pp. 68.

[53]No author. May 1976. Offshore Drilling Sought as Prelude to OCS Sale. Offshore. Vol. 36, No. 5. pp. 271.

[54]Op. cit. Interior Picks 152 Tracts for Fall Lower Cook Lease Sale. pp. 29.

[55]Op. cit. Offshore Drilling Sought as Prelude to OCS Sale. pp. 271.

[56]No author. May 1976. Cook Inlet Wins Clean Bill in Government Oil Spill Study. Offshore. Vol. 36, No. 5. pp. 282.

[57]Information for this subsection was derived from three sources, op. cit., Lower Cook Inlet Draft EIS, op. cit., Waldrop, and State of Alaska Comments Regarding BLM's Lower Cook Inlet Draft EIS. State of Alaska, September 1976. (Subsequently referred to as Alaska's Comments on the Cook Inlet EIS.)

[58]Op. cit. Alaska's Comments on the Cook Inlet EIS.

[59]Op. cit. Lower Cook Inlet Draft EIS. pp. 10-11.

[60]Ibid. pp. 13-16.

[61]Information for this subsection was taken from two sources, op. cit., AEIDC Report, and Response to Call for Nominations in the Western Gulf of Alaska. State of Alaska, March 9, 1976, Appendix B (Subsequently referred to as Alaska's Response to Western Gulf Nominations.).

[62]O'Connor, F. R. and P. L. Dobey. No date. An Analysis of Future Petroleum Development on the Alaskan Outer Continental Shelf, Kodiak Area. State of Alaska, Department of Natural Resources, pp. 2-4 (Subsequently referred to as the O'Connor and Dobey Report.)

[63]No author. May 10, 1976. Interior Picks 564 Tracts for Western Gulf of Alaska Sale. Oil and Gas Journal. Vol. 74, No. 19. pp. 40.

[64]Ibid.

[65]Op. cit. Alaska's Response to Western Gulf Nominations. pp. 2.

[66]Op. cit. Interior Picks 564 Tracts for Western Gulf of Alaska Sale. pp. 40.

[67]Op. cit. Alaska's Response to Western Gulf Nominations. pp. 1-3

[68]No author. June 7, 1976. Coring of Kodiak Shelf Tracts Due in Early July. Oil and Gas Journal. Vol. 74, No. 23. pp. 57.

[69]No author. June 5, 1976. Tracts Selected for Intense Environmental Study. Offshore. Vol. 36, No. 6. pp. 112.

[70]Op. cit. O'Connor and Dobey Report.

[71]Ibid. pp. 4-15.

[72]Op. cit. Waldrop. pp. 2-30.

[73]Ibid. pp. 21.

[74]Op. cit. Methodology for Facility Siting. pp. 5-6.

[75]Alaska Industry. March 1976. Kodiak: Surrounded by Troubled Waters. Alaska Industry, Anchorage, Alaska. pp. 34.

[76]Anchorage Times. March 9, 1976. Koniag Officials Ask for Hearing. Anchorage Times, Anchorage, Alaska. pp. 1.

[77]Ibid.

[78]Information for this subsection is taken from, op cit., AEIDC Report and Beaufort Sea Environmental Impact Statement. State of Alaska 1975 (Subsequently referred to as Beaufort EIS).

[79]Rintoul, B. September 1975. Gulf of Alaska May Offer Best Prospects for Oil and Gas. Offshore. Vol. 35, No. 10. pp. 86.

[80]Op cit. Beaufort EIS. pp. 488.

[81]For more information refer to the following articles:

No author. January 20, 1975. Shift in Leasing Priority to Beaufort Sea Sought. Oil and Gas Journal. Vol. 73, No. 3. pp. 56.

No author. February 17, 1975. Alaska Pushes for Early Sale in Beaufort Sea. Oil and Gas Journal. Vol. 73, No. 7. pp. 36.

No author. June 2, 1975. Wildcatters Poised for Beaufort Sea. Oil and Gas Journal. Vol. 73, No. 23. pp. 98-102.

No author. August 18, 1975. Beaufort Sea State Lease Sale Definite for 1976. Oil and Gas Journal. Vol. 73, No. 33. pp. 38.

Southeast Alaska Empire. August 12, 1975. State Will Lease in Beaufort Sea. Southeast Alaska Empire, Juneau, Alaska. pp. 1.

[82]Op. cit. Gulf of Alaska May Offer Best Prospects for Oil and Gas. pp. 87.

[83]Op. cit. Offshore Oil: Activity Stepping up Though Conflicts Remain. pp. 95.

[84]Southeast Alaska Empire. June 26, 1975. Inlet Decision Hurts Beaufort. Southeast Alaska Empire, Juneau, Alaska. pp. 10.

[85]Op. cit. Wildcatters Poised for Beaufort Sea. pp. 102.

[86]No author. March 1975. 5-10 Years Needed for R&D of Beaufort Sea. Offshore. Vol. 35, No. 3. pp. 54.

[87]Op. cit. Wildcatters Poised for Beaufort Sea. pp. 102.

[88]Op. cit. Beaufort EIS. pp. 19.

[89]Ibid. pp. 18-19.

[90]Carter, L. J. March 5, 1976. Oil Drilling in the Beaufort Sea: Leaving it to Luck and Technology. Science. Vol. 191. pp. 930.

[91]Ibid.

[92]No author. February 2, 1976. Chance of Beaufrot Sea Oil Spill Seen Remote. Oil and Gas Journal. Vol. 74, No. 5. pp. 35.

[93]Op. cit. Oil Drilling in the Beaufort Sea: Leaving it to Luck and Technology. pp. 930.

[94]Op. cit. Beaufort EIS. pp. 17.

[95]Ibid.

[96]Ibid. pp. 16.

[97]Op. cit. State Will Lease in Beaufort Sea. pp. 1.

[98]Op. cit. AEIDC Report.

[99]Op. cit. Waldrop. pp. 45-50.

[100]Ibid. pp. 45-46, 48.

[101]Information for this subsection was taken from, op. cit. AEIDC Report.

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5.3 -- WASHINGTON STATE

Outer Continental Shelf development is, presently, not a major issue in Washington State. There are two reasons for this. One, BLM's initial lease sale off the coast of Washington is not scheduled until late 1978. Being 2 years away, most state residents and government officials are preoccupied with more immediate issues and problems. And two, the prospects of finding large amounts of oil and gas on Washington's OCS are not favorable. Since the oil industry has judged the Washington-Oregon area as having the least potential for petroleum development of any domestic offshore region being considered by Interior's accelerated leasing program, the prospects of large-scale impacts resulting from leasing seem remote.

Alaskan OCS development may have a greater impact on Washington State than OCS operations adjacent to its coast. The economies of both states are tied closely together and development of large amounts of Alaskan OCS petroleum will no doubt stimulate economic activity in western Washington. In addition, once production begins large amounts of offshore Alaska crude could be transshipped and/or processed in Washington State which may result in environmental impacts such as oil spills and air pollution in the state. However, even if large amounts of petroleum are found on Alaska's OCS it will take several years of exploratory drilling before large-scale development and construction activities can begin and it will be close to a decade before large amounts of OCS petroleum could be transshipped to Washington State. Thus while Alaska OCS development may become an important issue in the future in Washington State, it is not a matter of immediate concern.

5.3.1 Description of the Region[1]

Fish and wildlife resources are diverse and varied along the coastal shoreline and continental shelf of Washington State. The region is characterized by a relatively narrow continental shelf and large inland bays and estuaries.

Washington State has 2,337 miles of coastline comprising 157 miles along the Pacific and 2,180 miles along inland waterways and estuaries. Further, it has the largest estuaries on the Pacific Coast. The most important of Washington's estuaries are Willapa Bay (70,400 acres), Grays Harbor (61,400 acres), and Puget Sound (1.6 million acres). These estuaries are migration and spawning areas for commercially and recreationally important fish and shell fish.

Salmon (coho, sockeye, chinook, pink and chum) are the most important fishery resource in Washington State. Flounder, rockfish, ling cod, hake, halibut, Pacific herring, and Pacific ocean perch are also commercially important. In addition, razor clams are a major recreational resource (8.6 million harvested annually between 1967 and 1971). Dungeness crabs and bay clams also contribute to the sport harvest. In 1972, 500,000 sport fishermen landed 5 million pounds of shellfish valued at $3.8 million.

A number of marine mammals inhabit the State's coastal waters. The California sea lion, Steller sea lion, fur seal and harbor seal all live and breed along Washington's ocean coast. Destruction Island is a major harbor seal pupping area. Further, much of the shallow shelf is used by the endangered gray and Pacific right whales.

Washington State is on the Pacific flyway for waterfowl. Virtually the entire coastal area, including harbors and offshore islands is used

by most, if not all, of the waterfowl and shorebird species found in the flyway. Each fall about 10 million ducks and one million geese use the flyway coming from their summer breeding grounds in Alaska and Canada to winter in the interior portions of California. The large protected saltwater area of Puget Sound with extensive shoreline and shoal water estuaries, mud flats, and marsh vegetation provides ideal feeding and resting areas for these waterfowl.

The ocean coast of Washington State has large stretches of undeveloped shoreline. However, the Seattle-Tacoma metropolitan area is intensely developed with residential and commercial-industrial-transportation facilities. The proximity of the Coast Range (Olympic Mountains) to the ocean shore limits the area available for development. Most development has occurred between the Coast Range and the more inland Cascade Range on or near Puget Sound. Numerous recreation areas are located along the ocean coast in areas of sandy beach. A part of Olympic National Park is also located along the ocean coast.

5.3.2 History of OCS Operations

Between 1960 and 1964 several oil industry groups engaged in exploratory operations on Washington State's outer continental shelf and found, by geophysical surveys, numerous promising structures on the shelf. In October 1964 the Federal government offered a total of 1,090,000 acres for oil and gas leasing in 11 separate areas off Washington and Oregon.[2] Six major oil companies spent more than 7.7 million dollars in acquiring offshore leases adjacent to Washington.[3]

Six exploratory wells were subsequently drilled on the continental shelf off Washington. However, commercial quantities of oil were not

found as a result of this exploratory activity. Eventually the leases on these lands expired on December 1, 1969, and reverted to Federal ownership.[4]

The failure of the oil industry to find petroleum in the 1960's is largely responsible for their lack of enthusiasm regarding future leasing in the area.[5] Nevertheless many structures were left untouched by the relatively small amount of exploratory drilling that occurred in the region. Some geologists and state officials are still optimistic that substantial amounts of recoverable petroleum may exist on the OCS off Washington.[6]

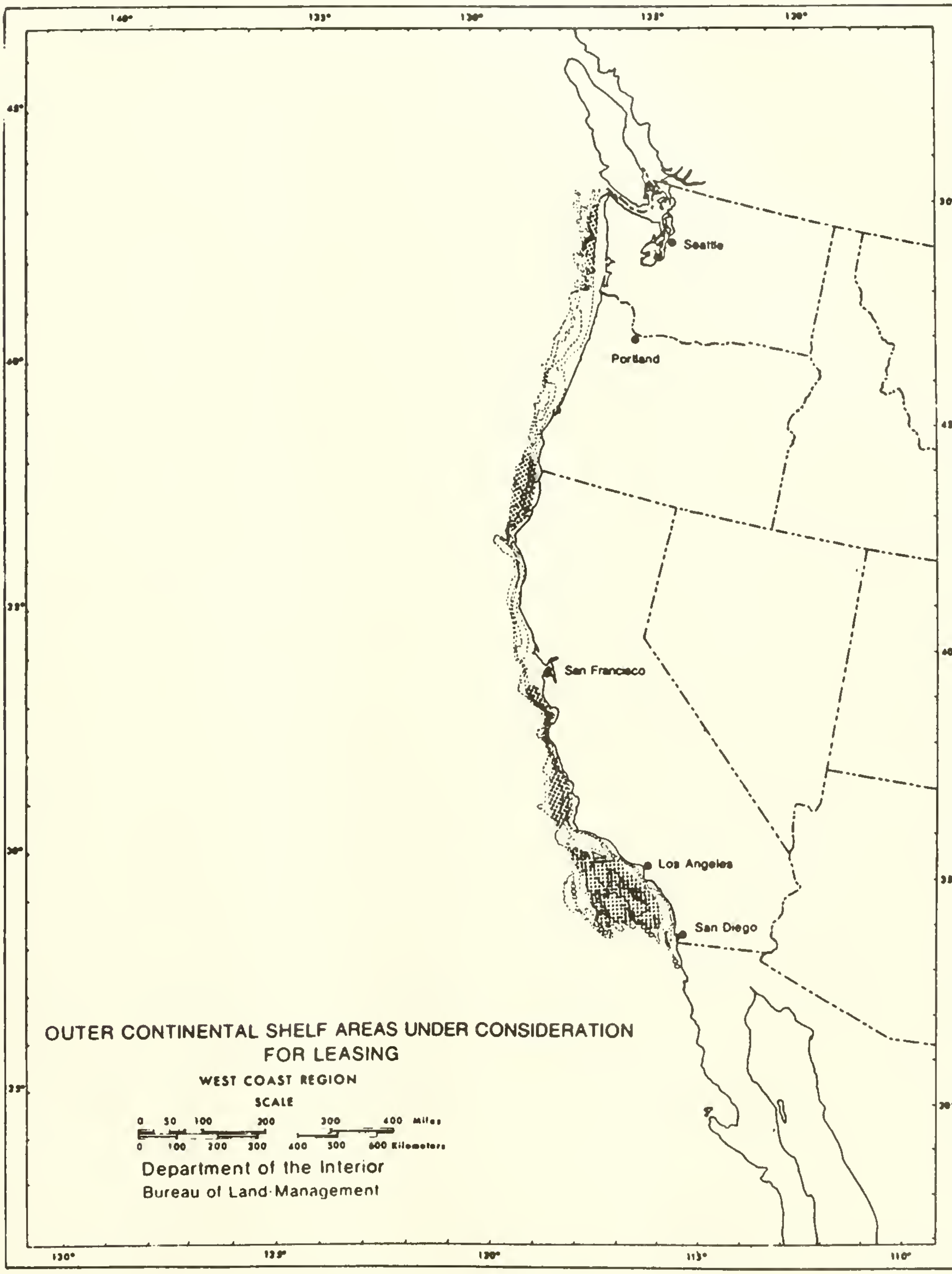
5.3.3 Status of OCS Operations

The Bureau of Land Management has scheduled a lease sale on the Washington-Oregon Continental Shelf for October of 1978 (Figure 9), and another lease sale in November of 1980. This sale will be combined with a lease sale off the northern coast of California. BLM's schedule for the Washington-Oregon area is to:

1. Begin baseline studies by December of 1976.
2. Call for nominations from industry in August of 1977.
3. Select tentative leasing tracts by December of 1977.
4. Issue a Draft Environmental Impact Statement in March 1978.
5. Hold a public hearing in May of 1978.
6. Complete the final impact statement by August of 1978.
7. Hold the lease sale in October of 1978.

OCS-related activity in Washington has been limited, to date, to two studies now in progress. The first study, being done by the Arthur D. Little Co. under contract from Washington's Department of Ecology (DOE),

Figure 9. The proposed lease sale area off the Washington-Oregon coasts (Source: BLM Final Programmatic EIS).



is examining potential onshore impacts in Washington State from OCS development off Alaska and Washington as well as the impacts resulting from the transshippment of Alaskan and foreign crude to the state. A draft of this $110,000 study will be ready by February 1977. DOE is also financing a second study to gather baseline data in northern Puget Sound in order to evaluate the effects of oil on coastal marine life. June 1977 is the deadline for this $570,000 study.

Some onshore support activity related to OCS development is occurring in Washington State. The Tacoma Boatbuilding Co., located in Tacoma, Washington, has helped construct a Mariner semi-submersible rig for Santa Fe International Inc. The 4,200-ton, 270-ft. long vessel may soon be drilling exploratory wells off the Coast of West Africa.[7] And Kaiser Steel Corp. has proposed a second and much larger OCS-related project in Grays Harbor County. Kaiser plans to construct an offshore drilling platform assembly plant on a 45-acre site at the mouth of the Hoquiam River. If built, the plant may employ as many as 500 persons.[8]

The Department of Ecology is the principal state agency in Washington involved in OCS and coastal management and will be in charge of allocating the substantial amounts of federal monies under the 1976 Coastal Management Act Amendments. They also have responsibility for managing many marine and coastal environmental baseline studies and the department heads the state's oil spill prevention program. In addition, DOE has considerable expertise and authority in water pollution and water resource management activities.

The State Energy Facility Site Evaluation Council is another important entity in Washington State. Since March of 1976, any developer

wanting to site a petroleum-related facility has been required to get a permit from the Site Evaluation Council. The Council is comprised of 14 members, many of which are heads of other state agencies including the Director of the State Energy Office who acts as chairman of the Council.

Washington State has substantial authority and expertise to manage onshore and coastal impacts resulting from OCS development. The state has been a leader in environmental legislation and was the first state in the nation to complete a federally approved coastal zone management program. Further, Washington has had experience since the 1950's regulating oil and gas facilities. In recent years, both the Governor and the state legislature have been willing to impose controversial regulations on the oil industry. The latest such action involved the banning of supertankers over 125,000 tons in Puget Sound, a law which is currently being contested in the courts.[9]

5.3.4 Alaskan Oil

Alaska may soon become the foremost petroleum producing state in the United States. The USGS has estimated total recoverable petroleum resources in Alaska, both onshore and offshore, at from 28.3 to 65.3 billion barrels of oil and from 75.6 to 178.7 trillion cubic feet of gas.[10] If these resources are developed, large amounts of petroleum will have to be transported from Alaska to consumer markets in the lower 48. Much of this oil will come in tankers traveling from Valdez to west coast ports.

Development of onshore and offshore Alaskan petroleum resources will have important implications for Washington State. Ports located on Puget Sound in western Washington are considered by the oil industry to be prime candidates for receiving large amounts of Alaskan oil by tanker

due to their proximity to Alaska and midwest markets, their deep and protected harbors, and the existing petroleum infrastructure in the region (including four large refineries). But many Washingtonians are against the prospect of Puget Sound becoming a major transshippment terminus for Alaskan oil because of the risk of damaging oil spills. Puget Sound's recreational and natural resources are substantial; the value of fishery resources (principally salmon) in the region is estimated at between $80 to $100 million a year. In addition, Puget Sound has five National Wildlife Refuges, four of which lie along an important oil tanker route through the Rosario Straits.[11]

Prior to 1972 most of the oil refined in Washington State (300,000 barrels/day) came from Canada and the Trans-Mountain pipeline. Only 30,000 barrels a day were transported by tanker. Now this figure has risen to 150,000 barrels per day as a result of recent cutback in Canadian petroleum exports and will increase to the entire 300,000 barrels with the elimination of Canadian exports in 1978.[12] Presently other sources of crude (Alaska Cook Inlet, California, and foreign oil) are making up the difference.[13] And soon Prudhoe Bay oil (around mid-1977) will be a major source of crude for the region's refineries.

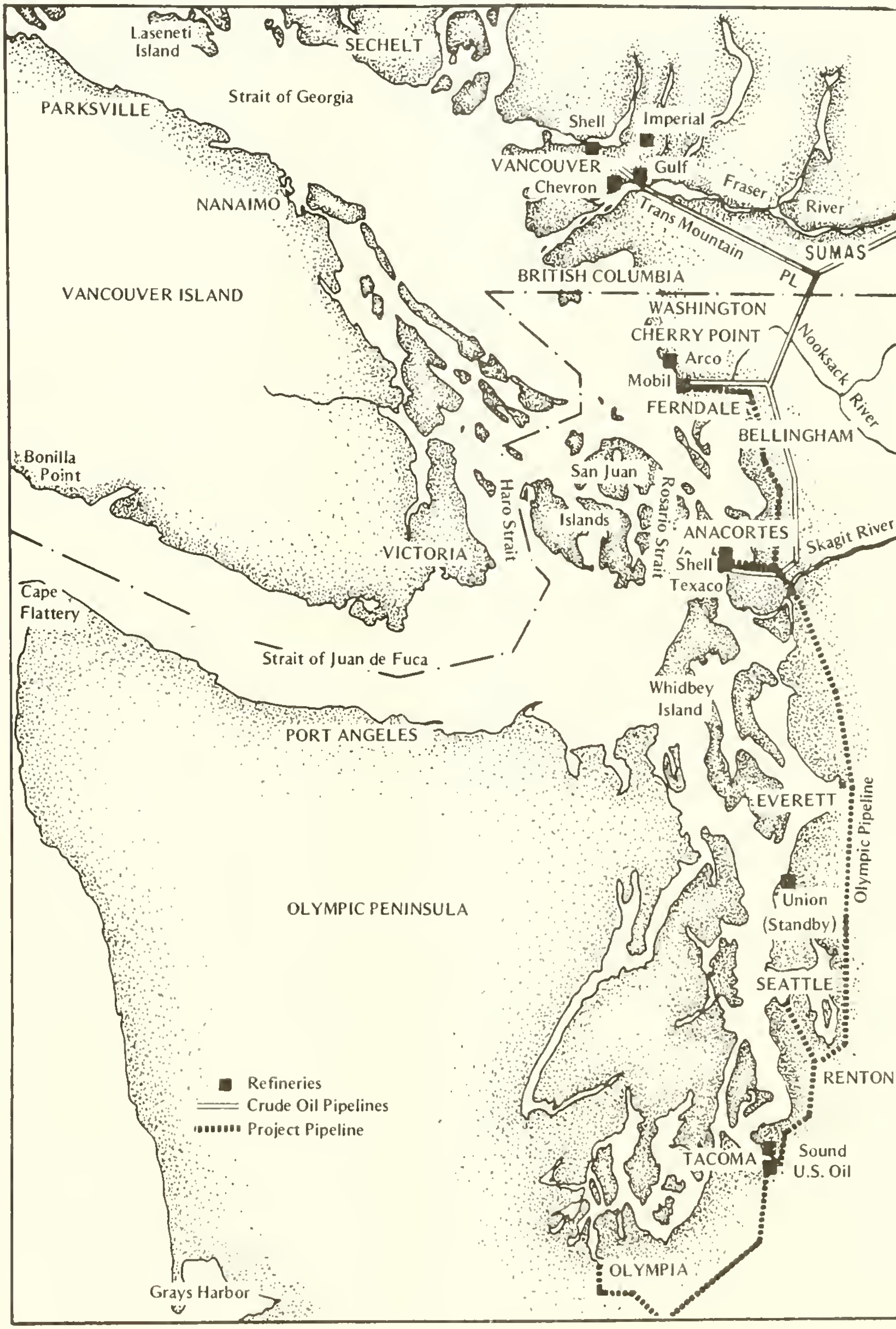
The oil industry has predicted a surplus of oil on the west coast once the Alaskan pipeline is completed.[14] Given the impending shortages of petroleum in the mid-west, several proposals have been made by industry to transport surplus Alaskan crude to Midwest refineries.[15] One proposal, made by the Northern Tier Pipeline Co., would build a pipeline from western Washington to Clearbrook, Minnesota, in order to transship

800,000 barrels a day to mid-west refineries.[16] If the Northern Tier pipeline is built, petroleum throughput by oil tanker in Washington State would jump to 1,100,000 barrels per day.[17]

Debate surrounding the environmental impact of oil tankers in Puget Sound has focused on the threat of massive oil spills in the productive and intensely used waters of the Sound. Many observers believe that such spills could be very damaging to the Sound's wide variety of economic, ecological, and recreational activities.[18] Among the uses of Puget Sound that would probably suffer the greatest impact in the event of an oil spill are (1) a large sport and commercial fishery, (2) a multi-million dollar recreation, tourist and boating industry, and (3) fish (salmon and shellfish beds) and wildlife (wintering waterfowl) populations and habitat.

The principal issue of controversy, however, has been where to land the oil from tankers in western Washington. Four alternative sites have been the most frequently mentioned: (1) a common-use terminal at or west of Port Angeles; (2) a common-use crude terminal at Burrows Bay; (3) the independent development of deepwater berths at the four existing major refineries at Anacortes and Cherry Point and (4) a common-use terminal at Cherry Point.[19] The last three alternatives would all require tankering petroleum into Puget Sound, through Rosario or Haro Straits to an east sound location (Figure 10). The Port Angeles alternative would avoid the risk of transporting oil along this route. A 1974 study by the Oceanographic Commission of Washington estimated a Port Angeles terminal to be 6 to 7 times safer in terms of tanker accidents and oil spills than a terminal on the east side of the Sound.[20] But

Figure 10. Potential sites for oil and gas activities in western Washington (Source: Washington Cooperative Extension Service).



Washington's Department of Commerce and Economic Development has estimated that the Port Angeles alternative would cost about $300 million more than the expansion of existing Puget Sound terminal facilities.[21] The oil industry and Governor-elect Dixy Lee Ray favor the cheaper alternative of expanding east side terminals.[22] Environmentalists, and Senators Jackson and Magnuson, on the other hand, favor the environmentally safer alternative at Port Angeles.[23] Washington's coastal management program also specifically incorporates the policy of a single transfer facility at Port Angeles.[24]

If western Washington does become a major transshipment point most of the petroleum over the next 10 years will come from Alaska's Prudhoe Bay and Cook Inlet and foreign imports. Alaskan OCS petroleum will not be on line before the middle 1980's. But if large petroleum finds do occur on the Alaska OCS, this may eventually increase tanker traffic and petroleum facility operations in western Washington. It is possible that Washington State might expand transshipment and refining operations to accommodate the increase in Alaskan oil.

Alaskan OCS petroleum development has another important impact on Washington State. As previously mentioned, Washington and Alaska economies are closely interrelated; an economic boom in Alaska will probably stimulate support and secondary industries in Washington. Puget Sound ports and businesses have noted a considerable increase in business to Alaska since construction of the Alaska pipeline began. Extensive OCS development in Alaska may well act as a similar stimulus. But information regarding the magnitude of future OCS-related activity

in Washington is sketchy at present. The CEQ in their 1974 OCS study estimated 32,000 new jobs for the Puget Sound area by the year 2000 under high OCS development assumptions. These figures assume that 1 to 3 new refineries and three petrochemical complexes will be built between 1985 and 2000 in the state.[25] However, the accuracy of the CEQ employment estimates have been questioned by other studies and federal agencies.[26]

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5.4 -- OREGON

Two OCS leasing areas lie adjacent to the coast of Oregon, the Washington-Oregon area off the north coast and the northern California area off the south coast (Figure 9). The Bureau of Land Management plans to lease both of these areas at the same time in 1978 and in 1980. However, outer continental shelf petroleum development is not yet an important issue in Oregon. Leasing is still 2 years away and Oregon's government and citizens are more concerned about other more immediate problems.

5.4.1 Description of the Region[1]

The Oregon Coast has 500 miles of shoreline comprising 352 miles along the Pacific Ocean proper and 148 miles of bay/estuary coastline. Three hundred miles of shoreline are beach (60 percent), with the remainder consisting of rocky headlands, marsh areas, bulkheads and revetments. Most of the Oregon coast is bordered by mountains with the Oregon Coast Range occurring in the northern portion and the Klamath Mountains and Siskiyou Mountains along the southern coast.

Oregon has 14 separate estuary systems but they only total about 56,000 acres. The largest estuaries are the Columbia River (15,000 acres), Coos Bay (9,543 acres), Tillamook Bay (8,839 acres) and Umpqua-Winchester Bay (5,712 acres). Oregon's estuaries are valuable for their production of clams, oysters and crabs. The state annually harvests about 160,000 razor clams, 1.8 million bay clams, and 225,000 dungeness crabs.

A mild maritime climate characterizes the Oregon coast. It is an area of high precipitation (up to 100 inches annually). Frequent winter storms bring gale force winds and heavy precipitation. Fog is a common occurrence along the coast.

Many species of marine mammals inhabit the Oregon coast. The fur and harbor seal are abundant on small offshore rocks and islands. These islands are also important breeding areas for marine mammals along the coast. About 1,000 northern sea lions are observed annually on these islands.

By far the most important commercial fisheries resource in Oregon are salmon. Important salmon species harvested are coho, sockeye, chinook, pink and chum. Other important fisheries harvested are flounders, rock-fishes, albacore, Pacific hake, halibut, Pacific herring, ling cod, and Pacific ocean perch.

Many sea birds utilize the coastal waters of Oregon. Shearwaters and falmors are particularly numerous along the coast during their seasonal migration. Eighteen species of colonial sea birds have been observed off the Oregon coast. The most common of these in order of abundance are: Leaches petrel, common murre, fork-tailed petrel, western gull, tufted puffin, and pigeon guillemont. The total breeding population of sea birds off Oregon is approximately 1,500,000 and the annual sea bird production has been estimated to be 400,000 individuals.

Only a narrow strip of land lies between the ocean and the Coast Range in Oregon. As a result most development in the state has occurred further inland. About one-fifth of the Oregon coastline has not been

developed. In addition, Oregon's scenic shoreline and beaches have long attracted tourists from throughout the country. Over 40 percent of the coast is used for public recreation while 16 percent is used as private recreation lands.

5.4.2 History of OCS Operations

Vigorous OCS exploration began in 1961 off the coast of Oregon. After 3 years of promising geophysical work, the BLM, in October of 1964, leased 101 tracts off the coast of Oregon and Washington for $43 million in bonus bids. Following this sale eight exploratory wells were drilled but none found commercial quantitites of petroleum. Discouraged by these results, the oil industry diverted their efforts away from Oregon to pursue discoveries off Alaska and California.[2] In 1969 all leases sold in the 1964 sale reverted back to the Federal government.

During the 1960's, Astoria, Coos Bay and Newport were the headquarters for supplies and services for the seismic and drilling fleets. The fleet used for these offshore activities consisted of: 1 floating platform, 1 heavy drilling ship, 6 light ships, 7 supply ships, 12 auxiliary boats, and 14 seismic boats. OCS operations contributed about $30 million directly to Oregon's economy in the 1960's.[3]

5.4.3 Status of OCS Development

BLM has announced the schedule of pre-leasing activities for the OCS sales off Oregon's coast. Both the northern California sale and the Washington-Oregon sale have the same schedule as follows:

1. Baseline studies will begin in December of 1976.
2. Interior will call for nominations in August of 1977.

3. Tentative leasing tracts will be selected in December of 1977.

4. A Draft Environmental Impact Statement will be issued by March of 1978.

5. A public hearing will be held in May of 1978.

6. The final impact statement will be completed by August of 1978.

7. Both areas will be leased in October of 1978.

A second sale has been scheduled for November 1980. Only one preleasing study is underway in Oregon, to date. Oregon's Land Conservation and Development Commission (LCDC) is examining the institutional capability of the state to manage OCS development.

Two OCS-related facilities have been proposed by industry in Oregon. The first involves a proposal by Brown & Root to build a platform fabrication yard near Astoria, Oregon.[4] This fabrication yard would be located on 400 acres of land 10 miles from the Pacific Ocean on the Columbia River.[5] The company plans to build platforms capable of operating in water depths of up to 1,000 feet for use off the coasts of Alaska, Washington, Oregon and California.[6] Platform fabrication could begin as early as 1977 and employ as many as 1,200 persons.[7] Pacific Northwest Natural Gas has proposed the other facility, an LNG storage facility near Newport, Oregon. This facility will probably require the regular service of LNG tankers.[8] Neither the LNG facility or the platform fabrication proposal have obtained the necessary permits yet.

Oregon has only one small refinery in the state, a 14,000 b/d plant at Portland.[9] However, three refinery proposals along the Columbia River have recently received approval to begin construction from Oregon's

Department of Environmental Quality. Of these proposals one company, Columbia Independent Refinery, Inc., has since cancelled its plans to build a 50,000 b/d plant at Portland.[10] A second firm, Charter Energy Co., has not decided whether to build a 52,400 b/d refinery at St. Helens.[11] But a third company, Cascade Energy, has announced that it will begin construction of a 30,000 b/d refinery on an 85-acre site acquired from the Port of St. Helens by the end of 1976. The Cascade refinery will process crude oil brought in by tanker and will have docking facilities capable of handling 230,000 bbl vessels.[12] The refinery will be equipped with desulfurization units and may use Alaskan north slope crude.[13]

The Land Conservation and Development Commission (LCDC) is the principal state agency in Oregon involved in OCS and coastal management. The Commission has formulated some draft goals and guidelines dealing with petroleum development on the continental shelf. These goals and guidelines recommend:

(1) Giving clear priority to the management and protection of renewable resources over the development of non-renewable resources like petroleum.

(2) Establishing permit-review procedures which require a developer wanting to explore, extract, store or transfer petroleum on the continental shelf to (1) specify the methods and equipment to be used; (2) finance the cost of monitoring and inspecting such operations; (3) use the best pollution abatement technology available; (4) be held liable for individual or public damage;

and (5) describe the extent and magnitude of onshore support and operation facilities and their social, economic, and environmental impacts on the Oregon coast.[14]

The LCDC's future role in OCS management may diminish, however. The LCDC has recommended to Governor Straub that a new OCS office be established within the Office of the Governor to assume principal responsibility for OCS-related matters.

Finally, Oregon will probably have a Federally approved coastal management program prior to OCS leasing adjacent to its coast. The state is well advanced in its coastal program and a draft EIS proposing Federal approval of its program was issued in February of 1976. Once Oregon's program is approved, the federal consistency provisions of the 1972 Coastal Zone Management Act will go into effect which may provide added leverage for the state in managing OCS development.

5.4.4 Footnotes

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5.6 -- APPENDIX 1: OCS ISSUES IN ALASKA

Numerous issues surround the development of petroleum resources on the Alaskan OCS. The most serious controversies have arisen from disputes between state and Federal officials. While both state and Federal officials favor developing Alaska's offshore petroleum resources, there is substantial disagreement over how to proceed. Basically the Federal government, with the full support of industry, wants to develop all nine of Alaska's OCS petroleum basins as rapidly as possible under present OCS law. State officials, on the other hand, favor a much more cautious and deliberate approach to OCS development and under a system which provides for a greater state management role and a share in OCS revenues. The specific conflicts between federal and Alaska officials are:

1. Offshore land ownership,
2. Adequacy of petroleum technology,
3. Alaska's role in OCS decision making, and
4. Revenue sharing.

Several offshore areas have been subject to land ownership disputes between Alaska and the Federal government. The major court decision to date involved the ownership of lower Cook Inlet. In 1967 the United States and the State of Alaska began litigation when the state proposed leasing tracts in this region. The state claimed jurisdiction over the submerged lands of lower Cook Inlet based upon the historic bay doctrine. Despite rulings supporting Alaska's claim by the U.S. District Court and the U.S. Court of Appeals, the Supreme Court, in June 1975, rejected Alaska's claim in maintaining that the state did not prove historic

title to lower Cook Inlet.[1] The decision gave the U.S. Government paramount authority over these lands and rights to all royalties, currently estimated at $1 billion.[2]

A Federal-state jurisdictional conflict is also brewing over submerged lands in the Beaufort Sea. The dispute involves the ownership of 80,000 acreas between the coast and a chain of barrier islands seven to eight miles offshore. Since the state owns only the submerged lands for three miles around the islands under the Submerged Lands Act of 1953, there is a one- to two-mile strip of land between the coast and islands claimed by both governments. The state had originally planned to challenge the Federal government's claim to the strip using the historic bay argument but have altered their strategy after the recent Supreme Court decision regarding ownership of the lower Cook Inlet. Instead two other arguments may be made; the first may involve the use of the "straight base-line boundary" concept which is a method by which nations sometimes draw their offshore boundaries, and the second approach may argue that a barrier of shoals off these islands should be used as the state's coastline.[3] Although the amount of land in question is small, the revenues from leasing may be considerable. The disputed territory lies just north of Prudhoe Bay and many geologists believe these lands are prime propects for petroleum development.[4]

Another second area of disagreement concerns the adequacy of OCS technology. Here worries are greatest about offshore production and drilling technologies where there is the danger of a major oil spill from natural or human causes. In particular, many doubt if industry can operate safely in an environment where storm swells sometimes exceed

70 feet (Gulf of Alaska) and sea ice flows with great force (all areas north of St. George Basin). Federal regulations have not been vigilant or timely enough to suit Alaskans who want to see OCS operating orders strengthened and safety provisions provided within the leasing agreements. Many state officials want technology problems ironed out prior to leasing while Federal officials see plenty of time after leasing has occurred.

Alaska also wants a greater role in the leasing program. The state's role has been limited to reviewing environmental impact statements and advising Federal agencies on the wisdom of pre-leasing policies and actions. Under the provisions of the 1953 OCS Lands Act, the state has no real authority prior to leasing. A case in point was the bitter state-Federal dispute over the northern Gulf of Alaska sale where Interior Secretary Kleppe held the 1.1 million acre lease sale over the strong objections of the State. It is not surprising, therefore, that Alaska (along with most coastal states) advocates amending the 1953 OCS Lands Act to give it some authority prior to leasing.

Ultimately, though, much of the state's dissatisfaction with the Federal OCS program can be traced to its monetary arrangements. Alaska is resentful at not receiving any royalties or bonuses from OCS leases while at the same time having to finance many of the public services to support such operations. Not surpisingly, the state strongly supported the revenue-sharing provisions of the recently enacted Coastal Zone Management Act Amendments. The state views these monies as critical to their managing OCS impacts as considerable sums of money will be needed to help finance public services and infrastructure, to conduct environmental and planning studies, and to hire the requisite planning and management expertise.

5.6.1 Footnotes

[1]Alaska Construction and Oil. November 1975. BLM Seeks Impact on Tracts That May Be Sold in Lower Cook Inlet. Alaska Construction and Oil. pp. 70.

The court cited prior ruling in boundary cases against Louisiana and California. These found that a coastal nation must have traditionally asserted and maintained dominion with the acquiscence of foreign nations in order for a body of water to be considered a historic bay. In its 6-2 majority ruling, the court rejected the state's claim that acquiscence of foreigr nations was proved by the failure of any foreign nations to protest, calling it "meaningless".

[2]Southeast Alaska Empire. June 24, 1975. State to Fight Inlet Ruling. Southeast Alaska Empire, Juneau, Alaska. pp. 1.

[3]Doener, K., III. September 1975. Political Conflict May Delay Future Offshore Play. Offshore. Vol. 35, No. 10. pp. 91.

[4]No author. February 17, 1975. Alaska Pushes for Early Sale in Beaufort Sea. Oil and Gas Journal. Vol. 73, No. 7, pp. 36.

5.7 -- APPENDIX 2: ALASKA'S RESPONSE TO OCS DEVELOPMENT

Although limited by funds and personnel, Alaska is actively dealing with OCS development. Much credit should rest with the Hammond administration. Politically the Governor is pro-environment and is an active supporter of fishing interests.[1]

State officials have carefully pointed out that while the state opposes the Federal OCS accelerated leasing program, Alaska is not opposed to prudent offshore petroleum development. More specifically, Governor Hammond's administration has adopted the following policies with regard to OCS development:

1. Development of OCS resources must be designed and implemented in such a manner as to protect to the fullest extent Alaska's high degree of environmental quality, quality of life, abundant fish and wildlife, and present and potential marine food production.
2. A national energy policy must be developed that relates the energy needs of the nation, of the western region of the United States, and of the state of the nation's supply.
3. Oil exploration should be separated from oil development.
4. The provisions of the National Environmental Policy Act must be fully implemented.
5. The state must be a full participant in all levels of planning and management regarding OCS resources. Alaska must be involved in decisions regarding when, where, and whether to lease certain areas of the Outer Continental Shelf, where renewable

resources of fish and wildlife exceed the value of the oil and gas contained there.

6. Prime consideration must be given to onshore impacts; management and planning for onshore impacts must precede the initiation of exploration activities.

7. Development of the oil and gas resources of the outer continental shelf must pay its own way.[2]

Within the state, Governor Hammond has given high priority to enacting a state coastal management act. Two quite different coastal management proposals have been submitted by the Governor but both have failed to pass the state legislature. The first proposal, submitted during the 1975 Legislative Session, would have established a strong state planning and regulatory role in coastal management,[3] but this bill was politically very unpopular.[4] Native corporations, oil and economic development interests, and local governments all opposed passage of the bill. As a result the Governor revamped and submitted a coastal management bill during the 1976 season that stressed public participation, local management, and data gathering activities.[5] Although opposition to this bill was less intense, it also failed to pass the state legislature.

In general, the state legislature has not directed much attention toward the issue of OCS development. Most petroleum related legislation proposed during the last two sessions has dealt with the Alaskan pipeline. The legislature did pass a tanker safety act that may directly affect OCS operations in Alaska. This Act provides monetary incentives to the oil industry to equip large tankers with safety controls not presently required in recent petroleum transportation regulations issued by the Coast Guard.[6]

Numerous state agencies have some management responsibility related to OCS development in Alaska, but the following four departments have principal management responsibility: (1) the Department of Fish and Game, (2) the Department of Natural Resources, (3) the Department of Environmental Conservation, and (4) the Department of Community and Regional Affairs. Currently all four departments are doing impact studies involving OCS development.[7] The role of each department is summarized below.[8]

1. Department of Fish and Game. The mandate of Fish and Game is to manage, maintain and improve the fish, game and aquatic resources of the state. Their powers include planning, permitting, review and enforcement authority over designated land and water areas of the state.

2. Department of Natural Resources. The responsibilities of DNR include: (1) the leasing of minerals, tidelands, and submerged lands (includes the granting of right-of-way leases), (2) the regulation of oil and gas operations on state lands, (3) the selection of state lands under the 1958 Statehood Act, (4) the classification of state lands by appropriate uses, (5) the regulation of fresh water use, (6) zoning unorganized borough lands,[9] (7) the acquisition and management of state parks, and (8) the regulation of all material sales (e.g., sand and gravel).

3. Department of Environmental Conservation. The DEC is principally concerned with preventing and abating air, water, and solid waste pollution. To accomplish these goals, the Department has

the authority to (1) issue effluent permits, (2) formulate air and water classification systems, (3) develop a water pollution control plan, and (4) establish safe water and hygiene sewage disposal facilities.

4. Department of Community and Regional Affairs. The CRA is the principal agency involved in OCS onshore planning. The Department provides information, funding (HUD 701 and state funds) and planning expertise to local governments. The Department of Community and Regional Affairs will play an important role in formulating onshore and coastal development policies even though they have no regulatory power at this point.

Two other state entities have important roles to play. The first is the Alaska Coastal Management Office within the Division of Policy Development and Planning. This office will allocate the substantial amounts of Federal CZM monies and coordinate policies and programs involving Alaska's coastal zone. At present, the state's number one issue in coastal planning is preparing for OCS impacts.[10] And second, the state has formed an OCS Task Force which is comprised of high level state officials to fund, review and modify Department of Community and Regional Affairs planning efforts and submit approved OCS policies and plans to the Governor.

Finally, there are two features in Alaska which deserve special mention as they will be important to OCS operation. First and foremost has been the creation of Regional and village native corporations under the 1971 Alaska Native Claims Settlement Act. This Act provides for conveyence of 40 million acres (as well as monies) to Alaska natives,

land which is currently being selected by the regional and village corporations. Tentative selections made so far have included many potential OCS onshore support sites (as well as many mineral and resource rich lands). This Act is transforming Alaskan natives into a powerful political and economic force in the state. Land is also being transferred from Federal to state holdings as a result of the Alaska Statehood Act. Under the provisions of this Act, Alaska is entitled to choose 104,450,000 acres of land within 25 years of statehood. To date a great deal of land still remains to be selected by the Department of Natural Resources. Future state land selections will be made with an interest in obtaining potential OCS onshore support sites.[11]

5.7.1 Footnotes

[1]Hammond narrowly defeated former Governor Egan for the Governorship in 1974.

[2]Fairbanks Daily News--Miner. September 18, 1975. Hammond Sets Down OCS Policies. Fairbanks Daily News--Miner, Fairbanks, Alaska. pp. A-5.

[3]Southeast Alaska Empire. May 7, 1975. Panel Strips Authority from Coast Zone Bill. Southeast Alaska Empire, Juneau, Alaska. pp. 1.

This bill would have established a statewide planning council and given powers to issue permits for development along the coast to municipalities. In the unorganized boroughs, the Department of Environmental Conservation would have held permit power after adoption of the Coastal Plan in 1978.

[4]Southeast Alaska Empire. May 5, 1975. Coast Zone Bill Opposition Strong. Southeast Alaska Empire, Juneau, Alaska. pp. 1.

[5]Alaska Industry. November 1975. State Coastal Zone Management Program Revamped by Governor. Alaska Industry, Anchorage, Alaska. pp. 9, 60.

[6]Southeast Alaska Empire. Apirl 28, 1976. DEC Leader Satisfied With Tanker Bill. Southeast Alaska Empire, Juneau, Alaska.

[7]Untitled manuscript. John Williams. pp. 35.

[8]November 26, 1975. Inventory of Existing Land Management Tools in Alaska. Part I and II. Alaska Coastal Management Program.

[9]A large part of Alaska's coastal zone is outside of local jurisdiction.

[10]Op. cit. Williams. p. 34.

[11]Interview with Bob Waldrop. September 16, 1976.

5.8 -- APPEND[illegible]. ENDANGERED AND THREATENED WILDLIFE SPECIES THAT OCCUR IN COASTAL REGIONS OF OREGON AND WASHINGTON

Common Name	Scientific Name	Status	Distribution	Reason for Status
Olympic mudminnow	*Novumbra hubbsi*	T	Olympic Penin., Wash.	Habitat change
Tule white-fronted goose	*Anser albifrons gambelli*	T	Central Calif., north to Wash.	Small pop., vuln. to hunting
American peregrine falcon	*Falco perigrinus anatum*	T	Calif. to Alaska	Poor reproduction and adult survival
Sperm whale	*Physeter catodon*	E	Pacific Coast	Over-exploitation
Gray whale	*Eschrichtius robustus*	E	Pacific Coast	Over-exploitation
Blue whale	*Balaenoptera musculus*	E	Pacific Coast	Over-exploitation
Finback whale	*Balaenoptera physalus*	E	Pacific Coast	Over-exploitation
Sei whale	*Balaenoptera borealis*	E	Pacific Coast	Over-exploitation
Humpback whale	*Megaptera novaeangliae*	E	Pacific Coast	Over-exploitation
Right whale	*Eubalaena glacialis*	E	Pacific Coast	Over-exploitation

5.9 -- APPENDIX 4: ENDANGERED AND THREATENED WILDLIFE SPECIES THAT OCCUR IN COASTAL REGIONS OF ALASKA

Common Name	Scientific Name	Status	Distribution	Reason for Status
Aleutian Canada Goose	*Branta canadensis leucopareia*	E	Aleutian Islands, Western U.S.	Predation by Arctic foxes and rats
Short-tailed Albatross	*Diomedea albatrus*	E	Gulf of Alaska	Excessive hunting for feathers
Eskimo Curlew	*Numenius borealis*	E	Formerly N.E. Alaska Now U.S. east coast	Excessive hunting
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	E	Arctic Alaska, eastern and Middle No. Amer.	Population decline, due to pesticides (suspected)
American Peregrine Falcon	*F. p. anatum*	E	Non-Arctic Alaska to Baja California	Population decline, due to pesticides (suspected)
Sperm whale	*Physeter catodon*	E	Pacific Ocean	Over-exploitation
Gray whale	*Eschrichtius robustus*	E	Pacific Ocean	Over-exploitation
Blue whale	*Balaenoptera musculus*	E	Pacific Ocean	Over-exploitation
Fin whale	*Falaenoptera physalus*	E	Pacific Ocean	Over-exploitation
Sei whale	*Balaenoptera borealis*	E	Pacific Ocean	Over-exploitation
Humpback whale	*Magaptera novaenagliae*	E	Pacific Ocean	Over-exploitation
Black Right whale	*Balaena glacialis*	E	Pacific Ocean	Over-exploitation
Bowhead while	*Balaena mysticetus*	E	Pacific Ocean	Over-exploitation
Glacier Bear	*Ursus americanus emmonsii*	T	Glaciated Alaska, esp. near Yakutat	Over-exploitation

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